Project design document form
(Version 11.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Los Cocos II Wind Farm Project
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	6
Completion date of the PDD	28/02/2019
Project participants	Empresa Generadora de Electricidad HAINA (EGE HAINA)
Host Party	Dominican Republic
Applied methodologies and standardized baselines	ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" (version 12.3.0).
Sectoral scopes	(1): Energy industries (renewable energy)
Estimated amount of annual average GHG emission reductions	112,489 tCO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The proposed project activity aims to install and operate a 52 MW grid-connected wind farm located between the towns of Juancho and Los Cocos, in the south-western province of Pedernales in the Dominican Republic. The project developer is Empresa Generadora de Electricidad HAINA S.A. (EGE HAINA).

The project activity involves the installation and operation of 26 wind turbines[1], each with a capacity of 2 MW. The total installed capacity of the proposed project activity is 52 MW with an expected net electricity generation of 157,189 MWh per year. The electricity generated by the project activity will be supplied to the National Interconnected Electricity System (SENI[2]), displacing approximately 112,489 tonnes of CO_2 emissions per year from electricity generation at fossil fuel fired power plants. The project activity is expected to start operations in January 2013.

In addition, the proposed project activity comprises the civil and electrical infrastructure required within the wind farm site, as well as overhead power line connecting the project to the national power grid (SENI). The civil works comprise all access and site roads, footways, drainage, assembly platforms, lay-down area, site facilities, tower foundations, electrical sub-station civil works, and cable trenches. Besides, the works include the extension of the existing substation[3] at the project site and the installation of a new 138/34.5 kV power transformer to interconnect the new wind farm with electrical transmission grid; and a local grid within the wind farm site. In addition, an advanced monitoring and control system will be installed to monitor and control the electricity output from the wind farm.

The wind farm will be constructed by COBRA Energy, a Spanish company, with more than 60 years experience in the electricity sector and an important participation in the wind industry. COBRA carries out large energy projects on a turnkey basis which often require ongoing maintenance or operations management. These projects are primarily wind farms and industrial plants. COBRA will be working through its subsidiary Urbaenergía, S.L. y Energía y Recursos Ambientales Internacional, S.L. Unión Temporal de Empresas Ley 18/1982 *(UTE Los Cocos*).

Wind energy operations do not generate air or water emissions and do not produce hazardous waste. Nor do they deplete natural resources such as coal, oil, or gas, or cause environmental damage through resource extraction and transportation, or require significant amounts of water during operation.

Caribbean countries are highly dependent on oil and gas for their energy needs. The largest countries in the region are heavily dependent on imported crude oil and derivatives as their main source of primary energy, and the trend has intensified in recent years. The region's dependence on oil reflects its inability to diversify its energy sources. For this reason, Caribbean countries have not realized their potential for solar, wind, hydropower, and geothermal energy use.[4] Dominican Republic is not the exception. The main energy source in the Dominican Republic is imported oil and its derivatives. They contribute 75% of the total primary energy supply. Energy proceeding

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[1] The Project will install 23 Gamesa G97 and three Gamesa G90 turbines, for details see sections A2. and A.3.

[2] Sistema Eléctrico Nacional Interconectado (SENI) de la Republica Dominicana

[3] There is already an existing substation at the project site, which was installed for the wind projects Quilvio Cabrera and Los Cocos.

[4] Source: Inter-American Development Bank (IADB). "*Prospects for the Oil-Importing Countries of the Caribbean*" Ramon Espinasa, Oil and Gas Specialist - Energy Division - Infrastructure and Environment Department - IADB. September 2008. http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=1640644\

from national production represents only 16% of the supply and basically comes from firewood (7%), bagasse (4%) and hydro (3%)[5].

The development of wind energy in the Dominican Republic is fundamental for the diversification and sustainability of the energy sector and the reduction of greenhouse gas emissions. In the Dominican Republic, the SENI is composed mainly of fossil fuel fired power plants with little renewable electricity generation. Thus, the project will reduce the country's fossil fuel imports and diversify the sources of electricity generation, an important achievement for the transition away from fossil fuel electricity generation and for the reduction on the dependence on foreign energy sources.

Therefore, the proposed project will contribute to sustainable development through the following aspects:

- Reducing the imports of fossil fuels, and in consequence, strengthening Dominican Republic's energy security and self sufficiency, by taking advantage of its natural and renewable wind resource.
- Reducing GHG emissions generated from fossil fuel consumption in power plants connected to the grid;
- Creating employment opportunities in the nearby area where the project is located, during the assembly and installation of wind turbines and for operation of the proposed project;
- Although there is one grid-connected wind project in the Dominican Republic registered as a CDM project since 2006, it is not currently in operation[6]. Two other CDM projects are undergoing validation. One of these is "Los Cocos Wind Farm Project", with an installed capacity of 25.2 MW. The proposed project would be a second phase of that project. The other is a small-scale CDM project: "Quilvio Cabrera Wind Farm Project" with an installed capacity of 8.5 MW. Therefore, the Los Cocos II Wind Farm project will continue these initial examples of grid-connected wind energy capacity in the Dominican Republic, with a net generation of 157,189 MWh of renewable electricity per year.
- The project will contribute to promoting, developing and strengthening the renewable energy sector in the Dominican Republic, especially wind power which has a high potential for development in the country (as explained in section B.4).
- The project will contribute to technology and know-how transfer to the Dominican Republic. The project activity will install state-of-the-art technology that will provide clean and safe power generation; moreover, the installation and operation of these turbines will bring to the region new knowledge and experience for the benefit of local workers while requiring for specialized labour.

A.2. Location of project activity

Dominican Republic

[5] Source: *Energy-policy Framework Conditions for Electricity Markets and Renewable Energies. 16 Country Analyses.* German Technical Assistance Agency (GTZ). Environment and Infrastructure Division. Eschborn, November 2009. GTZ, TERNA Wind Energy Programme Internet: http://www.gtz.de

[6] Project 0175: El Guanillo wind farm in Dominican republic, registered in October 2006. Available at the web: http://cdm.unfccc.int/Projects/DB/AENOR1153378528.03/view. At the time of submitting this CDM-PDD for validation, the wind farm was not in operation, as it can be seen from the operational records of the SENI system, published by the Coordinating Organization (OC). The records are publicly available at the OC's web site: http://www.oc.org.do/. The most recent operational records for November 2011 (103._OC-GO-INF-103-2011_Rev.0.pdf) do not show any wind farms generating electricity to the SENI system.

The Dominican Republic is a nation on the island of Hispaniola, part of the Greater Antilles archipelago in the Caribbean region. The western third of the island is occupied by Haiti. It is the second largest Caribbean nation (after Cuba), in terms of area.

Figure 1: Dominican Republic

The project site is located between the towns of Juancho and Los Cocos, in the province of Pedernales, approximately 40 km southwest of the province of Barahona, and east of Haiti.

The Pedernales peninsula is referred to as one of the windiest parts of the Dominican Republic. Only one road along the coast of the Caribbean Sea connects the peninsula to Barahona and the rest of the country, and the project site is located along that road, connecting Barahona and Oviedo. The main economic activity of the province is agriculture, with production of food crops and livestock. Fishing is also an important activity.

The proposed wind farm lies on a ridge of elevation between 10 m and 100 m. The site consists mainly of irrigated farm lands relatively close to the coast line. The area where the turbines will be located is a flat terrain surrounded in the south by the ocean and in the east by a mountain range.

Figure 2: Aerial picture of the wind farm location

The climate in the project site area is tropical but dry, unlike most of the Dominican Republic, where high humidity and abundant rainfall dominate. Temperature variations across the seasons are relatively small from 20^0 C to 33^0 C.

Each wind turbine is located at the following geographical coordinates:

Table 1: List of wind turbines (WT) geographical coordinates[7,8]

WT	Type[9]	Easting (m)	Northing (m)	WT	Type	Easting (m)	Northing (m)
1	G97	257951	1978318	14	G97	259416	1977586
2	G97	257837	1978475	15	G97	259300	1977741
3	G97	258720	1978516	16	G97	259185	1977897
4	G97	260856	1978343	17	G97	259068	1978053
5	G97	260740	1978493	18	G97	258952	1978208
6	G97	260623	1978645	19	G90	258858	1977062
7	G97	260497	1978808	20	G97	258744	1977219
8	G97	258836	1978364	21	G97	258630	1977376
9	G90	260152	1977943	22	G97	258516	1977533
10	G97	260040	1978097	23	G97	258401	1977690
11	G97	259926	1978254	24	G97	258289	1977850
12	G97	259810	1978414	25	G97	258173	1978002
13	G90	259532*	1977431*	26	G97	258058	1978159

* Note: The location of the wind turbine No.13 was slightly altered in the most recent project layout established by EGE Haina compared with the layout in the Garrad Hassan Technical Note (see footnote 7).

The project location and the wind turbine layout are shown in Figure 3. The coordinates of the yellow (central) point of the project activity (between turbine lines 2 and 3) are Easting (m): 259501 / Northing (m): 1977944

Figure 3: Project location and wind turbine layout. The red line is the shows the project area, the blue points the turbine locations, and the yellow point a central point used for the coordinates given above.

A.3. Technologies/measures

Valid wind data have been recorded at the project site since February 2002. Data were collected on-site over a 36-month period between 2002 and 2005, using three 30-meter masts located across the project site. The measurements were analysed and presented in annual wind

7 Source: Garrad Hassan Technical Note: Energy production assessment of the Juancho Los Cocos II wind farm, Table 9. (120208 Garrad Hassan.pdf)

8 Coordinate system is UTM Zone 19Q WGS84 datum.

9 G90: Gamesa G90 2 MW wind turbine; G97: Gamesa G97 2 MW wind turbine. The park comprises 23 G97 and 3 G90 wind turbines.

assessment reports. The 3 year technical feasibility study which included site selection and wind resource monitoring and evaluation was carried out by the Danish research centre, RISØ[10].

From 2009 to 2012, EGE Haina carried out a more detailed assessment of the wind regime at the potential wind farm site. The analysis relied on wind data recorded at the project site since February 2002[11]. Two wind turbine models were considered, Gamesa G90 and G97, each 2 MW, at a hub height of 78 meters. The layouts considered are shown in Figure 4. The selected configuration of the wind farm consists of two long rows and two short rows of wind turbines in a northwest-southeast direction.

Basically, the turbines were selected based on the wind generation studies by the EPC contractor and ratified by the third-party consultant Garrad Hassan. In the final project layout, there are twenty-three G97 and three G90 turbines. Although for most turbine positions the G97 was the optimal choice, at three locations the G90 was suggested as the preferred option; thus both turbine types are selected for the project.

Based on the detailed wind assessment, the annual generation of Los Cocos II Wind Farm is expected to be approximately 162,000 MWh and the generation to be fed into the grid, after taking into consideration auxiliary consumption and losses at 34.5kV, would be about 157,189 MWh per year as explained in the following.

The generation 162,000 MWh is based on the investment decision date in October 2011. Initially, the third-party consultant Garrad Hassan studied different turbines layouts with around 67 MW in February 2011 for the project location (Vestas and Gamesa turbines)[12]. Based on that study, EGE Haina adjusted the layout in order to reduce the project size to 52 MW and optimize energy generation, which resulted in the layout with 26 Gamesa turbines and an annual generation of 162,000 GWh (not including energy losses at 34.5kV, transformers and auxiliary consumption). This value was used for the project presentation to the board of EGE Haina[13], estimating further the potential losses and auxiliary consumption.

After investment decision, Garrad Hassan carried out a new generation study for the final layout, which gives 161,700 MWh (same consideration of losses and auxiliary consumption). Since the values are very similar, the value of 162,000 MWh is used for consistency and to guarantee conservativeness in the financial analysis. In order to determinate the net generation, losses at medium voltage (34.5 kV), transformers and auxiliary consumptions need to be applied:

> Medium voltage losses and auxiliary consumption: At the moment of investment decision, the PP estimated the losses in medium voltage to be approximately 2% and auxiliary consumption approximately 1%. Since there are no evidences clearly indicating these values available at the moment of decision making, these estimates are cross-checked with measurements of the operational plants Quilvio Cabrera and Los Cocos I that have very similar conditions, in order to select the values conservatively for the financial analysis of the CDM project. The measurements of those plants during a 1-month period show that losses are 2.97% (value rounded down to two decimals, see detailed analysis in "Energy losses of Quilvio Cabrera (QC) and Los Cocos I (LC).xls"); thus this value is used since it is below the total estimated at the moment of decision making.

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[10] Source: Wind resource assessment report. *Risø-I-2374 (EN)* (6. 050701 Riso. Site Inspection.pdf); *Risø-I-2411 (EN)* (7. 051101 Riso. 18 cases.pdf); *Risø-I-2445 (EN)* (8. 060201 Riso.Site4.pdf); *Risø-I-2530 (EN)* (Risoe-I-2530 site4-12graphs-final.pdf)

[11] Source***:*** *Energy production assessment of the Juancho-Los Cocos II wind farm using Vestas V90 and V100 at 80 m hub height and Gamesa G90 and G97 at 78 m hub height*. GL Garrad Hassan report to EGE HAINA, 08/02/2012. (120208 Garrad Hassan.pdf)

[12] 140411 Garrad Hassan.pdf

[13] “HIC-2011.10.04-Board_Presentation_Final.pdf”, an overview of the evolution of the project size and generation studies is further provided in the “History from 67MW to 52MW (8Jun12).ppt”

Transformer losses: At the moment of investment decision, the PP estimated the transformer losses to be approximately 3%. Since there are no evidences clearly indicating these values available at the moment of decision making, 0% is used, which is conservative.

In light of the explanations above, the annual generation used throughout this PDD is 162,000 MWh x (100% - 2.97%) = **157,189 MWh**.

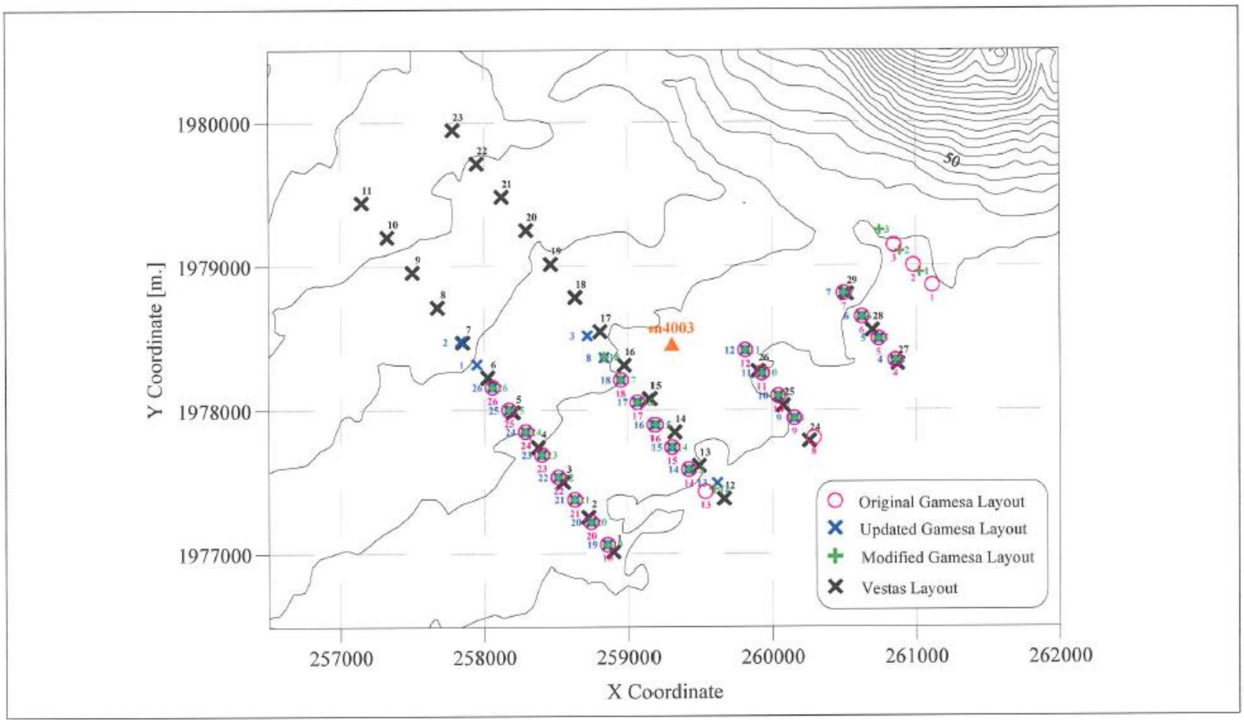

Figure 4. Configurations of wind turbines studied

As noted above, the wind turbines selected for the development of Los Cocos II Wind Farm project comprise Gamesa G90 and G97, each with rated capacity of 2 MW and an expected lifetime of 20 years[14].

Table 2 shows the main specifications of the technology applied in the project.

Table 2: Specifications of the technology.[14]

3 x WTG G90 and 23 x WTG G97	
Type	Horizontal axis wind turbine with variable rotor speed
Rotor diameter	90 m (G90) / 97 m (G97)
Number of blades	3
Rated Power	2000 kW
Hub height	78 m
Cut-in wind speed	3.0 m/s
Rated wind speed	11.0 m/s (G90) / 10.5 m/s (G97)
Cut-out wind speed	25 m/s
Design life time	20 years
Other equipment	
Power transformer	138/34.5 kV (interconnection with the grid)
Circuit breakers	138 kV
Switchgears	34.5 kV
Other equipment installed	Control and protection systems
Energy meters	$EG_{SMC,TR01,h}$: Main and backup meter ION 8650, class 0.2. ID 3275-PEJC-01. $EG_{SMC,TR02,h}$: Main and backup meter ION 8650, class 0.2. ID 3275-PEJC-02. $EG_{SMC,TR03,h}$: Main and backup meter ION 8650, class 0.2. ID 3275-PEJC-03. $EG_{SMC,TR04,h}$: Main and backup meter ION 8650, class 0.2. ID 3275-PEJCE3-T04. $EG_{PQ(QC),L1,,h}$: PQube 2.0 - monitoring equipment, class 0,2s. $EG_{PQ(LCI),L2+L3,,h}$: PQube 2.0 - monitoring equipment, class 0,2s. $EG_{PQ(LCII), L5+L6+L8+L9,h}$: PQube 2.0 - monitoring equipment, class 0,2s. For each wind turbine line (L1-L2-L3-L5-L6-L8-L9), there is an additional main and backup meter installed, all meter type PM870MG, class 0.5.

Figure 5 and Figure 6 show the power curves of the G90 and G97 turbines, respectively.

[14] Source: Certification reports by GL Garrad Hassan and Det Norske Veritas (DNV)

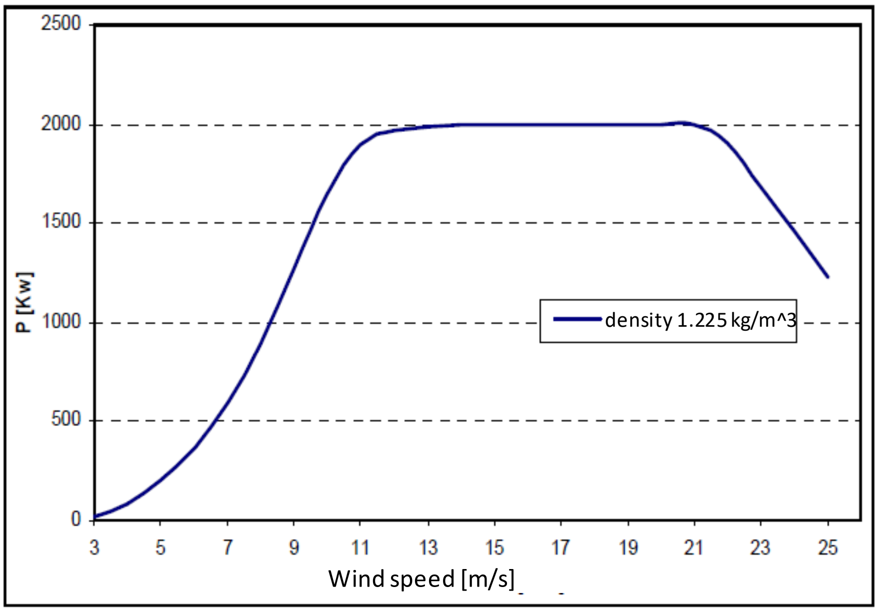

Figure 5: Power curve of Gamesa G90 – 2 MW wind turbine, showing power output as a function of wind speed, for an air density of 1.225 kg/m^3. (Source: GD022915_R6_Power_Curve_&_Noise_Curve_G90.pdf)

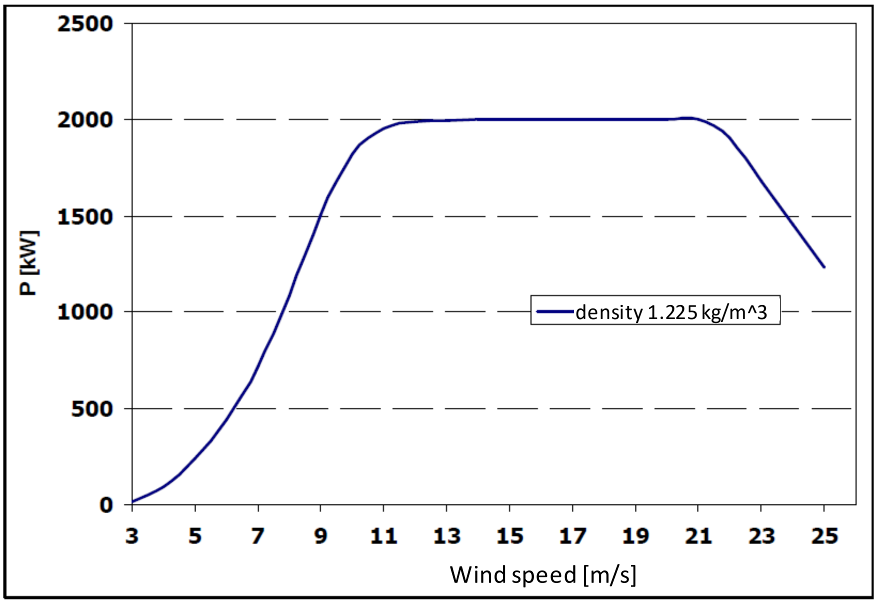

Figure 6: Power curve of Gamesa G97 – 2 MW wind turbine, showing power output as a function of wind speed, for an air density of 1.225 kg/m^3. (Source: GD092849_R1_Power_Curve_&_Noise_Curve_G97.pdf)

The wind farm is expected to start operations in January 2013. Local materials will be used for much of the construction works. COBRA Energy will be in charge of the turnkey design, engineering, supply, transportation, construction, erection, installation, commissioning, testing and completion of the wind farm. Since COBRA Energy is a company with vast experience in wind farm construction and operation, during the construction phase and the commissioning and testing of the plant, know how will be transferred to EGE HAINA's staff. The wind farm will be operated by COBRA under a ten year O&M agreement. The wind farm operators will receive a transfer of knowledge from working side by side with COBRA's engineers. Thus, know how will be transferred to the host country.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Dominican Republic (host)	Private entity: Empresa Generadora de Electricidad HAINA (EGE HAINA) Public entity: none	No

A.5. Public funding of project activity

There is no public funding for the proposed project.

A.6. History of project activity

1. PP hereby confirms that: The proposed CDM project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA); The proposed CDM project activity is not a project activity that has been deregistered.

2. PP further declares that: The proposed CDM project activity was not a CPA that has been excluded from a registered CDM PoA; No registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CDM project activity.

A.7. Debundling

Not applicable

SECTION B. Application of methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

The project activity is developed under the approved consolidated baseline and monitoring methodology ACM0002 *"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"* (version 12.3.0).

According to the methodology, the identification of the baseline scenario and the demonstration of additionality is assessed by applying the latest version of the:

- "*Tool for the demonstration and assessment of additionality*" (version 06.0.0).

Also, following the ACM0002, version 12.3.0 guidelines, the

- *"Tool to calculate the emission factor for an electricity system"* (version 02.2.1)

is applied in the development of the PDD for this proposed CDM project activity.

B.2. Applicability of methodologies and standardized baselines

The proposed approved methodology "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources"* (version 12.3.0) is applicable to grid-connected renewable power generation project activities that:

(a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant);

(b) involve a capacity addition;

(c) involve a retrofit of (an) existing plant(s); or

(d) involve a replacement of (an) existing plant(s).

In this case, the project involves option (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity, which in the specific case of the proposed project activity is the installation of a 52 MW wind farm.

The following conditions from ACM0002 (version 12.3.0) make the proposed project activity applicable as a CDM under the methodological framework mentioned:

- *The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;*

  NOTE: The proposed project activity consists of the installation and operation of a52 MW grid connected wind power plant.

- *In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which use the electricity generation of the existing plant(s) or unit(s) is not affected: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;*

  NOTE: This condition is not related to the proposed project activity since no capacity additions, retrofit or replacements are contemplated.

- *In case of hydro power plants, at least one of the following conditions must apply:*
  - *The project activity is implemented in an existing reservoir, with no change in the volume of any of the reservoirs; or*
  - *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity; or*
  - *The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity.*

  NOTE: This condition is not related to the proposed project activity, since it is not a hydro power plant. Moreover, additional conditions where the power density is lower than 4 W/m^2 are also not relevant for the proposed project activity.

The methodology is not applicable to the following:

- *Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;*

  NOTE: The proposed project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity.

- *Biomass fired power plants;*

  NOTE: The proposed project activity does not involve biomass fired power plants.

- *Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the reservoir is less than 4 W/m^2.*

  NOTE: This condition is not related to the proposed project activity since the proposed project activity does not involve hydro power plants.

- *In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".*

  NOTE: This condition is not related to the proposed project activity since no capacity additions, retrofit or replacements are contemplated.

Thus, the methodology is applicable to the proposed project activity.

The "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" (version 02) is applicable in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties.

The "*Tool to calculate the emission factor for an electricity system"* (version 2.2.1) is applied to calculate baseline emissions for a project activity that substitutes grid electricity. Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, there are specific conditions that should be met. Since the electricity system affected by the proposed project activity includes only grid connected power plants, no specific conditions should be assessed. The tool is not applicable if the project electricity system is located partially or totally in an Annex-I country.

B.3. Project boundary, sources and greenhouse gases (GHGs)

Source		GHG	Included?	Justification/Explanation
Baseline scenario	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main source of emissions in the baseline.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project scenario	Emissions from electricity generation	CO_2	No	According to ACM0002 version 12.3.0, there are no project emissions from wind farm projects.
		CH_4	No	
		N_2O	No	

The geographic and system boundary of the Dominican Republic's National Grid (SENI) can be clearly identified, as shown in Figure 7, and information on the characteristics of the grid is available.

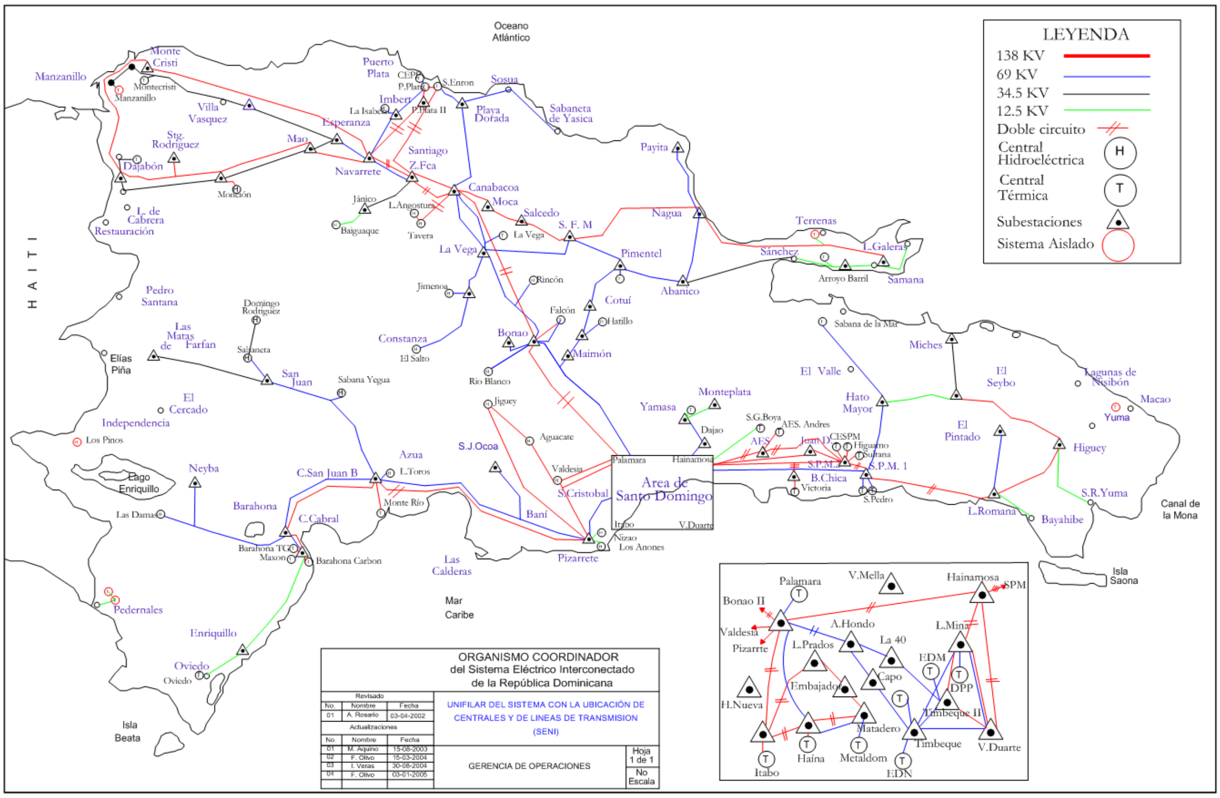

Figure 7: Dominican Republic's national grid (SENI)

Figure 8 shows the schematic diagram of proposed project activity in relation to two other CDM projects registered and one VERRA project registered (Larimar), as well as the project boundary.

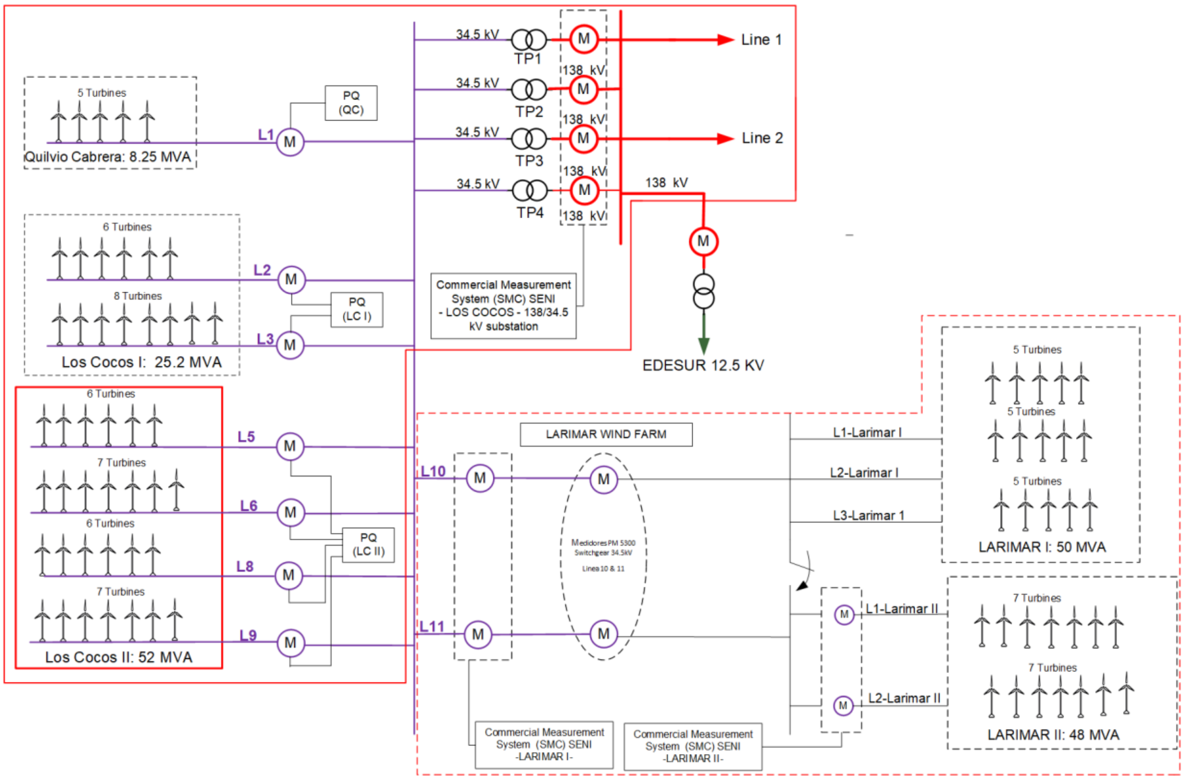

Figure 8: The Project boundary (red line) for Los Cocos II Wind Farm

Los Cocos II Wind Farm project includes the project wind turbines as well as the national power grid. The power generated by this project joins the output of Quilvio Cabrera and Los Cocos Wind Farms; after being transformed to 138 kV for connection to the national grid. The monitoring variables shown are described in Section B.7.1. Commercial measurement points, where electric meters are located, are shown schematically as red circles with an (M) and are recognized as SMCTR01, SMCTR02, SMCTR03 and SMCTR04. Internally each Wind Park summarize its generation lines in PQ(QC), PQ(LCI) and PQ(LCII) respectively. It is important to clarify that even though Larimar Wind Farm is part of the whole eolic system as can be seen in the figure, the data reported to the SENI is shown independently from the generations of Quilvio Cabrera, Los Cocos and Los Cocos II Wind Farms. Then it is possible to manage Larimar as an independent wind farm, since there is measurement equipment recognized by the OC-SENI on the side of 34.5 kV for lines L10 and L11.

B.4. Establishment and description of baseline scenario

As stated in the approved methodology ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*", version 12.3.0: If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (version 2.2.1).

Therefore baseline scenario consists of the electricity that would have been generated and delivered to the grid in the absence of the proposed project activity by:

a) Other plants currently connected to the SENI, and
b) New additions to the system

Brief description of the Dominican Republic electricity sector situation

During most of the 1990's the electricity demand in the Dominican Republic could not be satisfied since it grew at a faster rate than the generation offer. In the end of the 1990's, Dominican Republic initiated a reform process of the electricity sector in order to solve several problems associated with high generation costs, energy supply problems involving power outages and an inefficient management of the state-owned monopoly. The reform introduced a new market model with private participation and independent regulation, while keeping hydroelectric generation and electricity transmission controlled by state-owned companies. Since 2000, this competitive market started suffering difficulties due to the high fossil fuel prices and the crisis in the Dominican financial sector. The price for Fuel oil No. 6 and diesel, the fossil fuels used in 77% of the country's installed capacity, increased three-fold, negatively impacting generation costs[15]. For political reasons, the government has been unwilling to pass on the higher generation costs to consumers and, instead, subsidizes electricity by covering the operational deficit through fiscal subsidies. In the period 1999 – 2003, the installed capacity increased by 70% and private generators made an important effort in diversifying from petroleum, introducing coal, LNG and installing higher efficiency plants. Despite the availability of an effective generation capacity to cover demand, the sector's power generation was insufficient to satisfy the maximum demand, mainly due to the financial crisis of the sector.

[15] Source: CNE. República Dominicana. *Diagnóstico y definición de líneas estratégicas del sub-sector eléctrico*. Informe Final. Enero 29, 2008. (Diagnostico sub sector eléctrico - CNE.pdf)

The energy supply crisis has not been solved. Although electricity supply does not increase substantially in the private sector, electricity demand increases annually. Much of the supply that has entered the national electricity network has been provided by the plants owned by the government. Power outages affecting the country have undermined the quality and confidence of the private sector. Particularly in 2008, power outages affected the country dramatically, causing social unrest and private sector claims. Moreover, many clients do not pay for their electricity or have fraudulent connections, increasing the financial problems for electricity companies.

According to the National Energy Commission of the Dominican Republic (CNE), the main challenges faced by the Dominican Republic electricity sector is to seek reduction in electricity generation costs, diversification of the energy sources and promotion of clean energy. Also, it is important that the sector achieves and maintains its financial equilibrium[16]. In order to reduce dependence on fossil fuels, the Dominican Republic approved a renewable energy law in 2007, which provides tax exemptions for renewable energy projects.

Market Actors

The **National Energy Commission (Comisión Nacional de Energía, CNE),** which was established in 2001, is responsible for the formulation of laws and ordinances and the preparation of supply and demand forecasts. Acting under the auspices of the Ministry of Industry & Commerce and the Ministry of Finance, CNE is subordinate to the Minister of Planning and Economy, the Director of the Central Bank, the Ministry of Agriculture, the Ministry of the Environment and the Director of the Telecommunications Institute. This executive body has the legal power to enact regulations for the power sector.

The **Regulatory authority** is the **Superintendencia de Electricidad (SIE),** which was established by decree no. 118-98 on 16 March 1998 and began its work in July 1999. The SIE supervises market regulation, in particular the prices for regulated consumers. SIE's status as a public law body was officially established by the General Electricity Act of 2001.

The **Coordinating Organization (Organismo Coordinador – OC)** is another body that was created by the 2001 General Electricity Act. Its main task is harmonising the operations of the various power producers and network operators with each other on the wholesale market, and ensuring that the necessary capacity is made available on the spot market. This institution serves to promote the market's self-regulating capacities. It is not a state body. Its highest authority is a coordinating committee, the members of which include one representative each of the independent power providers, the power producers with private participation, and the transmission and distribution sectors.

Description of the Dominican Republic Interconnected System (SENI)

The electricity grid in the Dominican Republic is formed by the Dominican Electricity System (SENI). The SENI is composed of 15 generation companies (14 private companies based on thermoelectric generation and one state-owned company, EGEHID, dedicated to hydropower generation), one state-owned transmission company (ETED, Electricity Transmission Company) and three distribution companies: EDEESTE, EDENORTE and EDESUR. The government owns EDEESTE, EDENORTE and EDESUR, through the CDEEE (50%) and the "Fondo Patrimonial de las Empresas" (FONPER). The latter is a public-benefits fund to complement the activities of the private electricity companies.

In November 2011, 87% of the electricity generation was supplied by privately owned companies, and only 13% corresponds to the state owned company Hydroelectric Power Generation Company (EGEHID). The distribution across companies is shown in Figure 9.

[16] Source: CNE. República Dominicana. *Diagnóstico y definición de líneas estratégicas del sub-sector eléctrico*. Informe Final. Enero 29, 2008 (Diagnostico sub-sector eléctrico - CNE.pdf)

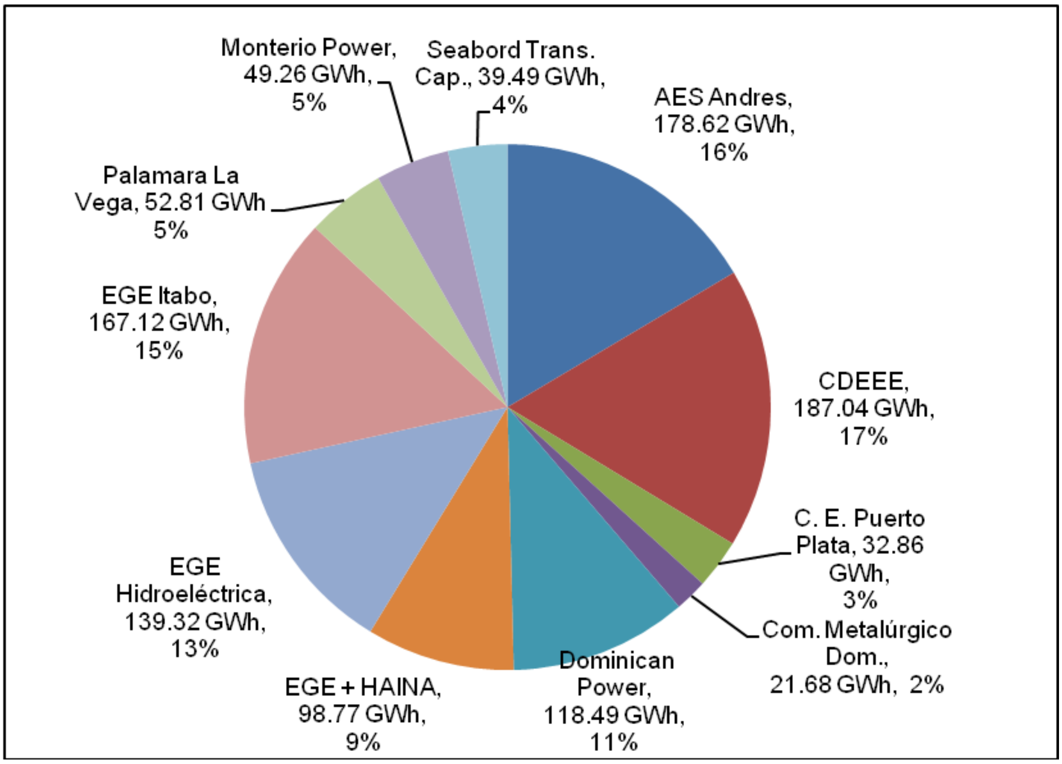

Figure 9: Total electricity generation (GWh) and share (%) by Electricity Company (November 2011) [17]

In November 2011, total generation was distributed by fuel type or hydro as shown in Figure 10.

[17] Source: Organismo Coordinador del Sistema Eléctrico Nacional Interconectado de la República Dominicana. Gerencia de Operaciones. Informe Mensual de Operación Real Noviembre 2011. Report OC-GO-INF-103-2011 Rev. D http://www.oc.org.do/ (*103._OC-GO-INF-103-2011_Rev.0.pdf)*

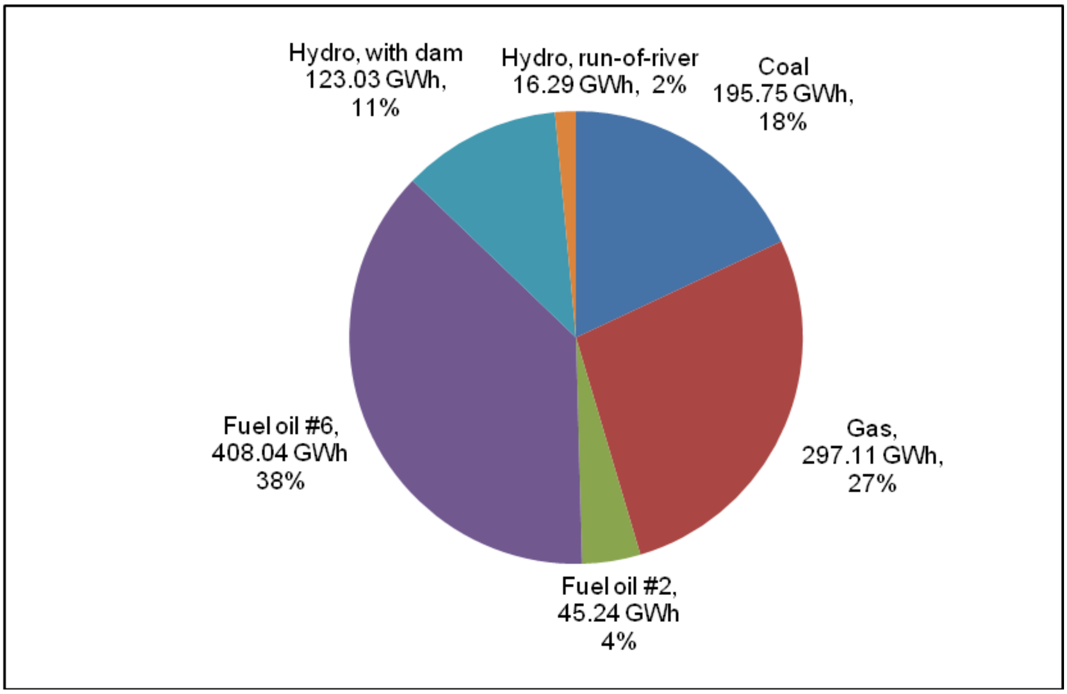

Figure 10: Electricity generation (GWh) and share of (%) by fuel type and hydro (November 2011). [18]

The main energy sources for electricity generation in November 2011 were fossil fuels totaling 87 % of the total. The remaining 13% correspond to hydropower plants, as shown in Figure 10.

For the period 2006 – 2020, CNE estimates an increase in electricity demand (GWh) on the SENI grid, averaging at 5.85% per year for the medium scenario and 4.03% for the low scenario[19]. It is expected that the increasing demand for electricity on the national grid will be satisfied by a mixture of existing installed capacity and new capacity additions. New capacity additions will be dominated by fossil fuel fired plants (mainly coal, fuel oil No. 6, diesel (fuel oil No. 2) and some natural gas) and a small proportion of hydropower. Figure 11 presents the total cumulative capacity for the SENI according to the expansion plan for the period 2006 – 2020 based on the medium scenario of the projected demand of electricity.

[18] Source: Organismo Coordinador del Sistema Eléctrico Nacional Interconectado de la República Dominicana. Gerencia de Operaciones. Informe Mensual de Operación Real Noviembre 2011. Report OC-GO-INF-103-2011 Rev. D http://www.oc.org.do/ (*103._OC-GO-INF-103-2011_Rev.0.pdf)*

[19] Source: *Plan Indicativo del Sector Eléctrico Dominicano. Periodo de Estudio 2006-2020.* Comisión Nacional de Energía. Page 5

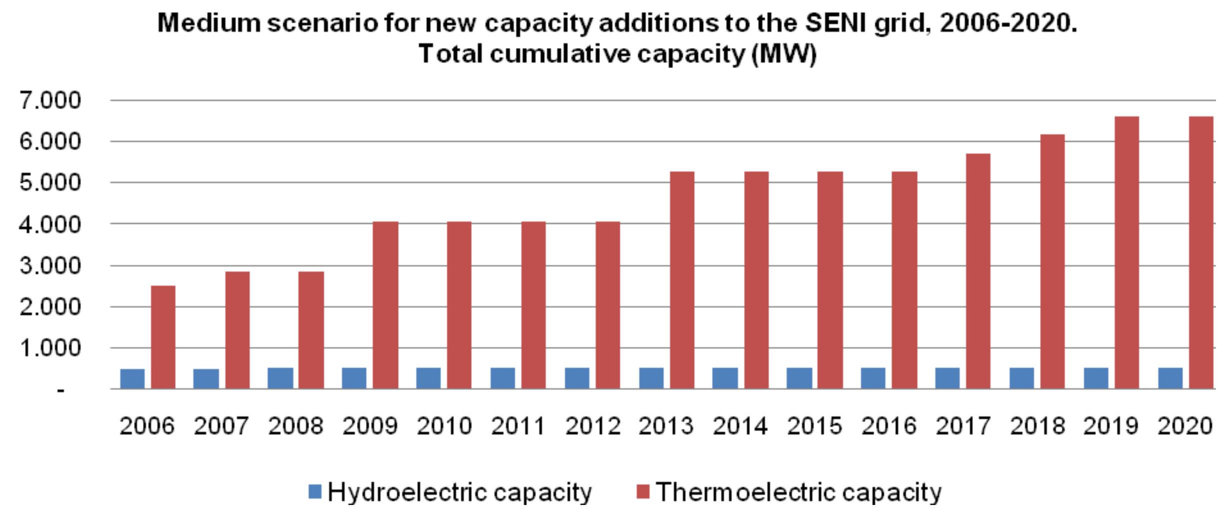

Figure 11: Medium scenario for total cumulative capacity (MW) in the SENI grid, 2006-2020.

Source: *Plan Indicativo del Sector Eléctrico Dominicano. Período de Estudio 2006-2020.* CNE. Table 11, page 29

The proposed project is expected to affect this generation mix mainly by displacing those power plants that have higher marginal costs, i.e. fossil fuel thermal plants. Therefore, if the proposed project activity never took place, the generation mix presented in Figure 11 would continue to prevail.

The National Energy Commission of the Dominican Republic (CNE), which is in charge of the development of regulations and laws and the previsions of demand and supply of energy, presented in 2004 the National Energetic Plan for the period 2004-2015 where it notes a wind potential of 10,000 MW in the Dominican Republic[20]. The wind resource in the Dominican Republic is strongly dependent on elevation and proximity to the coastline. The extreme southwestern and northwestern regions of the country are estimated to have the greatest number of areas with good-to-excellent wind resources for utility-scale applications, because the upper-air winds and ocean winds are greatest in these regions. The best wind resources are found in the southwestern provinces of Pedernales and Barahona and the northwestern provinces of Puerto Plata and Monte Cristi[21]. Despite its huge potential, the wind projects currently operating in the country are located only for self generation, and there are no wind projects currently connected to the national grid[22]. The only wind project developed in the country is El Guanillo, a 65 MW wind farm. This project was registered under the CDM in 2006, but, at the time of completing this PDD, it is not in operation yet[23].

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[20] Source: http://www.energias-renovables.com/america/ContenidoseccionesAm.asp?ID=14&Cod=1068&Tipo=&Nombre=Noticias

[21] Source: Wind Energy Resource Atlas of the Dominican Republic, *National Renewable Energy Laboratory* U.S. Department of Energy http://www.osti.gov/bridge

[22] Source: *Energy-policy Framework Conditions for Electricity Markets and Renewable Energies. 16 Country Analyses.* German Technical Assistance Agency (GTZ). Environment and Infrastructure Division. GTZ, TERNA Wind Energy Programme. Page 89. Eschborn, November 2009. Internet: http://www.gtz.de

[23] SENI Coordinating Organism (OC) daily reports. The daily operation reports present the operating parameters of all the electricity power plants connected to the SENI. As shown in the report from November 11, 2010 (Informe Diario OC-11-11-10.xls) no grid connected wind farm is operating in the SENI electricity system.

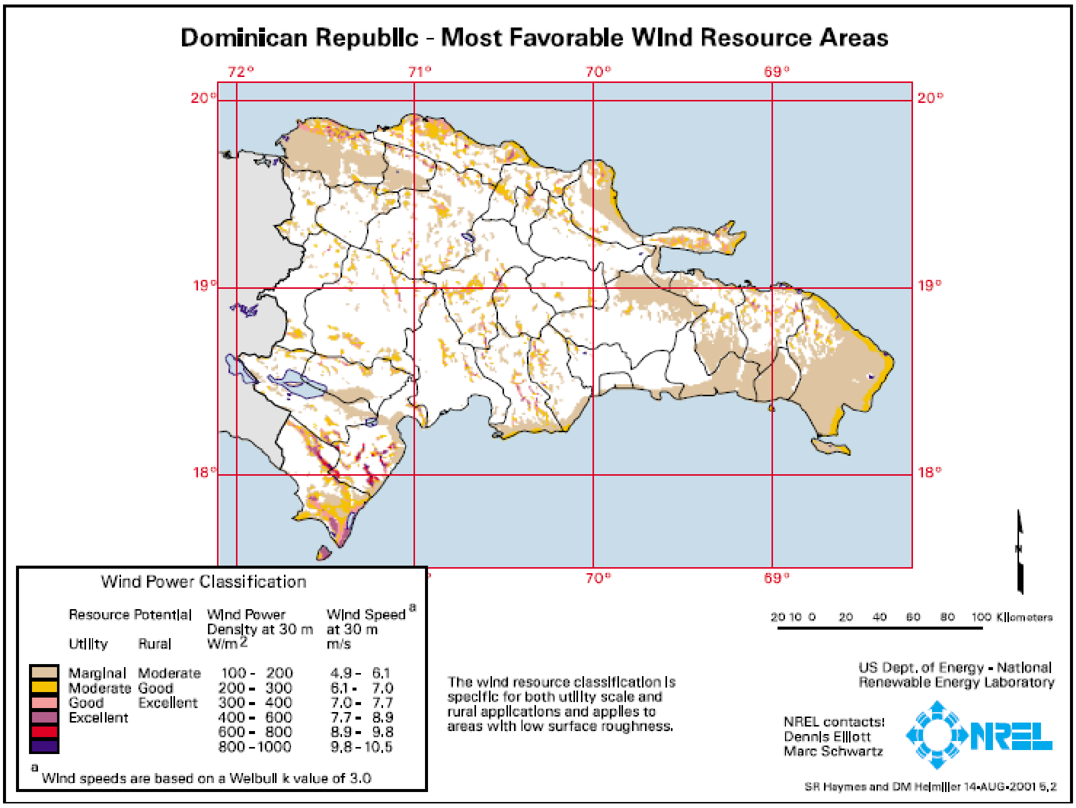

Figure 12: Most favourable wind resource areas of the Dominican Republic

As stated before, the diversification of the electricity sector in Dominican Republic is important due to the strong dependence on imported fossil fuels and the difficulty of transferring the high electricity generation costs and volatility to the electricity tariff. The results of an expansion plan presented by the CNE in 2008[24], with the objective of analyzing the main elements to determine a robust expansion strategy in electricity generation, show that a strategy based on coal plants has the lowest development cost. The report analyzes the development costs of the plants included in the expansion plan until 2012. According to the expansion plan presented by the CNE, the development of wind energy faces important challenges. On the one hand, generation costs are higher than those of coal and natural gas plants. Thus, the development of wind projects by the private sector depends on additional incentives; and it is probable that the development of the first wind projects require additional incentives to overcome the country and market risks and the uncertainties of plant factors due to lack of experience and sufficient wind studies. On the other hand, wind projects require high investments and, in most of the cases, electricity generation is not as stable as thermal generation with short-term and seasonal variations. These and other factors that increase the risks of the wind power project development for the private sector.

B.5. Demonstration of additionality

Los Cocos II Wind Farm Project is the Phase II of Los Cocos Wind Farm Project, which is currently under validation[25]. The timeline of events defining the start date of Los Cocos II Wind Farm is described in Table 3:

[24] CNE. República Dominicana. *Diagnóstico y definición de líneas estratégicas del sub-sector eléctrico*. Informe Final. Enero 29, 2008

[25] At the time of submission of this project for validation.

Table 3: Timeline of events leading to implementation of the project activity

Date	Entity	Event	Document/Reference
14/04/2011	Garrad Hassan	Estimation of the energy production for five different layouts for the Juancho Los Cocos Wind Farm	140411 Garrad Hassan.pdf
17/05/2011	Dominican Republic	Presidential Decree for the expropriation of land for the construction of the wind farm	Decreto 326-11.pdf
until 04/10/2011	HAINA	EGE Haina selects the most appropriate project layout studied by Garrad Hassan ("140411 Garrad Hassan.pdf") and modifies it in order to reduce its size and optimize generation. The resulting layout has 26 Gamesa turbines with 2.0 MW each and an expected annual energy generation of 162,000 GWh (without losses at 34.5 kV, auxiliary consumption and transformer losses).	"History from 67MW to 52MW (8Jun12).ppt"
04/10/2011	HAINA	Presentation of the project opportunity to the Board (Haina Investment Co., Ltd.)	HIC-2011.10.04-Board_Presentation_Final.pdf
12/10/2011	HAINA	Investment decision and approval of Cocos II with 52 MW. ***This is the date of investment decision for the project activity***	Resolución Los Cocos II (12Oct2011).pdf
09/11/2011	HAINA	Payment related to the decree for the expropriation of land for the construction of the wind farm from 17/05/2011. The payment is only around 0.03% of total investment cost.	Payment Expropriation of land (09112011).pdf
18/11/2011	HAINA	Confirmation of expropriation and transfer of land to EGE Haina	18-11-11 Acta Puesta en Posesion Dec-326-11.pdf
29/12/2011	HAINA	First payment to Cobra for the EPC. ***This is considered to be the start date of the project activity***	ONSHORE PAYMENT.pdf
30/12/2011	HAINA	First EPC contract with Cobra for the construction of Los Cocos II (25 wind turbines with a total of 50 MW).	Los Cocos Phase II EPC Agreement (30 Dec 2011).pdf
19/01/2012	HAINA	Second EPC contract with Cobra for the installation of an additional wind turbine with 2 MW	Los Cocos Phase II B EPC Agreement (19 Jan 2012).pdf Signed pages of EPC Contracts - Los Cocos II.pdf
08/02/2012	Garrad Hassan	Wind Assessment Final Technical Report indicating definitive placements of selected wind turbines and expected energy generation of 161,700 GWh (without losses at 34.5 kV, auxiliary consumption and transformer losses).	120208 Garrad Hassan.pdf
26/03/2012	HAINA	Prior Consideration Form submission to UNFCCC and DNA	Los_Cocos_II_-_Prior_Consideration_of_the_CDM_Form_22March2012.pdf
26/03/2012	UNFCCC	Prior Consideration Form appears on CDM website.	Email confirmation on 27/03/2012 in "Re- CDM Project Registration- Los Cocos II Wind Farm Project".pdf
27/03/2012	DNA	DNA confirms receipt of Prior Consideration Form	DNA_confirmation_prior_consid.pdf

The start date of the project activity was 29 December 2011. The *Guidelines on the demonstration and assessment of prior consideration of the CDM*, version 4, require that **"**for project activities with a starting date on or after 2 August 2008, the project participant must inform a Host Party designated national authority (DNA) and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date…" Both the DNA of the Dominican Republic and the UNFCCC Secretariat were so informed on 26/03/2011, which is within six months of the project start date. Hence the project meets the Guidelines for the prior consideration of the CDM.

The capacity taken into account at the time of investment decision and in accordance with project design presented in this PDD was 52 MW, although at that time the Environmental Permit (applicable for both Los Cocos and Los Cocos II) included a different capacity[26]. This happened since at the time of issuance of the environmental permit on 18/05/2011, the final layout was not yet know and the permit was requested for a hypothetical scenario at the project location. During the studies, the layout was adjusted and the final configuration with 52 MW established, which was taken into account at the time of investment decision in October 2011. The modification of the environmental permit will be requested in accordance with the applicable regulatory requirements, before starting project implementation.

Once investment decision was made and the EPC contract was negotiated, it was more convenient to separate it in two individual contracts as per the environmental permit at that time (i.e. one with 50 MW and one for the additional capacity that will be included in the modified permit) and so keeping more flexibility with the EPC contractor.[27]
The additionality of the project activity is demonstrated and assessed applying the "*Tool for the demonstration and assessment of additionality*" (version 06), as stated in ACM0002 version 12.3.0.

The tool provides a step-wise approach to demonstrate and assess additionality:

- Step 1. Identification of alternatives to the project activity consistent with current laws and regulations;
- Step 2. Investment analysis to determine whether the proposed project activity is not: (1) the most economically or financially attractive, or (2) economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).
- Step 3. Barriers analysis; and
- Step 4. Common practice analysis.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

According to ACM0002, version 12.3.0, under the heading "**Identification of the baseline scenario**" states:

"*If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*

> *"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the .Tool to calculate the emission factor for an electricity system."*

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[26] 28 x 1.8 MW and 25 x 2 MW = 100.4 MW

[27] This is not key for the additionality analysis and the project design, since it was after investment decision and in any case completely in accordance with the proposed project activity design. It is included here only to clarify the existence of two contracts.

The above then takes the place of ***Sub-step 1a: Define alternative scenarios to the project activity*** of the Additionality Tool.

The alternative baseline scenarios may then be stated as follows:

a) The proposed project activity undertaken without being registered as a CDM project activity.

b) Electricity that would be delivered to the grid by the proposed project activity would be generated by the operation of grid-connected power plants and by the addition of new generation sources

We then proceed to Sub-step 1b of the Tool:

Sub-step 1b: Consistency with mandatory laws and regulations

There are two main laws which define the regulatory framework of the electricity generation sector in Dominican Republic in general, and to promote renewable energy in particular. These are briefly described below.

- The ***General Electricity Act*** (created by the law 125-01 of 2001) and its modification with the law 186-07 of August 2007. The main issues defined by the law are the following:
    - Assurance that at least 20 % of all electricity trading is done on the spot market.
    - Limiting distribution company ownership of generating plants to not more than 15% of peak load in the interconnected system (renewable energy sources are exempt from this rule).
    - Regulation of electricity tariffs for public-grid customers with maximum connected loads of 2 MW as long as the customers do not enter into direct contracts with the suppliers.
    - Electricity companies which intend to operate an electricity generation business above 2 MW[28] must request a concession for the operation of electricity works.
    - Regulation of transit tariffs for the use of transmission and distribution of facilities.
    - Provision of preferential treatment to companies that generate electricity from renewable energy sources with regard to sales and load distribution - if prices and conditions are otherwise identical.
    - Exemption of companies generating electricity using renewable energy sources from national and local taxes for five years.

- The ***Law on Incentives for the Development of Renewable Energy Sources and Special Regimes, No. 57-07***[29] and its Implementation Regulation[30]. This law promotes wind farms with a capacity of up to 50 MW, mini hydropower plants of up to 5 MW, PV installations of all sizes, concentrating solar thermal power stations of up to 120 MW, biomass power stations with a biomass fuel input of at least 60% and an output of a maximum 80 MW, and ocean power plants. The law also promotes technologies for solar heat generation and refrigeration. The incentives include the following:

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[28] Source: *Reglamento para la Aplicación de la Ley General de Electricidad (No. 125-01).* Article 60. http://www.sie.gov.do/archivos/leyes/Reglamento%20para%20la%20Aplicacion%20de%20la%20Ley%20General%20de%20Electricidad.pdf

[29] Source: *Ley No. 57-07 de Incentivo a Las Energías Renovables y Regímenes especiales (07 de Mayo del 2007*). http://www.sie.gov.do/archivos/leyes/Ley%20de%20Incentivo%20a%20las%20Energias%20Renovables%20y%20Sus%20Regimenes%20Especiales.pdf

[30] Source: *Reglamento de Aplicación de la Ley No. 57-07, de Incentivo al Desarrollo de Fuentes Renovables de Energía y de sus Regímenes Especiales, aprobado por Decreto No. 202-08. Publicado en la G. O. No. 10469, del 30 de mayo de 2008*. http://faolex.fao.org/docs/pdf/dom95065.pdf

- 100% exemption over import duties for equipment, machinery and accessories required for renewable energy production.
- 100% exemption over sales tax, for all above mentioned equipments.
- 100% 10-year exemption over income tax, for companies or individuals benefited by this law until year 2020.
- Reduction to a fixed 5% on the tax over foreign financed interest payments, modifying Art. 306 of the Dominican Tax Code for the beneficiaries of this new law.
- Owners or renters of family homes and commercial or industrial establishments who shift to renewable energy systems for their private consumption are given a tax credit equal to 75% of the capital cost of the equipment purchased. Consumers will be able to discount the tax credit from their income tax for the next three years at a proportion of 33.33% per year
- This law also calls for the creation of a CO_2 emissions bond market under the platform of the Kyoto Protocol, regulated by the Ministry of Natural Resource's Mechanism of Clean Development.

Baseline scenario a) (project activity undertaken without the CDM) is consistent with the current laws and regulations of the country. Regarding the *General Electricity Law*, the project activity complies with all applicable legal and regulatory requirements. The *Law on Incentives for the Development of Renewable Energy Sources and Special Regimes*, states that wind farms with overall installed power of under 50 MW would normally be entitled to the incentives established by the Law. However, Article 2, paragraph II of the Regulations for the implementation of the Law indicates that the upper limit could be doubled for projects that install at least 50% of the original capacity requested. Since a capacity of 50 MW was initially requested and 25 MW constructed (Los Cocos Wind Farm Project, another CDM project currently in validation), this condition is met. Therefore authorization for the proposed project to seek the incentives has been applied for, and is awaiting a firm decision. Thus, scenario a) is a viable option and is included for further analysis.

Scenario b) is consistent with the current laws and regulations of the country. In the alternative scenario, electricity not generated by project activity would be dispatched to the SENI by existing plants (operating margin) and by future plants (build margin). As operations in existing plants and construction of new plants are valid alternatives under applicable laws and regulations, the alternative scenario is in compliance with the regulatory framework for electricity supply by existing or future SENI plants. Thus, scenario b) is a viable option and is included for further analysis.

Step 2: Investment analysis

The purpose of this step is to show that the proposed project activity is economically and financially less attractive than at least one other alternative, identified in step 1, without the revenue from the sales of certified emission reductions (CERs). The analysis is in compliance with the "*Guidance on the Assessment of Investment Analysis*" (Version 05).

Sub-step 2a. Determine appropriate analysis method

The project activity generates incomes other than CDM related income, so a simple cost analysis (Option I) cannot be applied. The available alternatives are investment comparison analysis (Option II) and benchmark analysis (Option III).

As stated in the "*Guidelines on the Assessment of Investment Analysis*" (version 05), Article 19: *"If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and* ***a benchmark approach is considered appropriate."***

The guidance further states that:

"The benchmark approach is therefore suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest."

This is clearly the case for a private facility in general, and for HAINA in particular. This justifies the choice of Option III: Benchmark analysis.

Sub-step 2b. Option III. Benchmark analysis

The additionality tool requires an identification of the most appropriate financial indicator. For the case of a power plant that would supply energy to the grid, the most appropriate indicator is the internal rate of return (IRR) as it characterizes the rate of return on invested capital. In this analysis an equity IRR is calculated in accordance with the additionality tool and the corresponding guidelines as indicated above. Taxation is included as an expense in the IRR calculation, i.e. the IRR is determined as a post-tax indicator.

In accordance with the "Guidelines on the assessment of investment analysis" (version 5) a default value for the expected return on equity is used for the benchmark. The relevant benchmark for energy projects in Dominican Republic (Group 1 with Moody's rating Baa3 as given in the guidelines) is 13.75% in real terms. As per the Guidelines, since the investment analysis is carried out in nominal terms, the real term values provided can be converted to nominal values by adding the inflation rate. Since no long-term inflation forecasts or target rates of the central bank for the duration of the crediting period exists, the average forecasted inflation rate of 4.30% for the next five years after the start of the project activity published by the IMF (International Monetary Fund World Economic Outlook) is used (based on the forecasts in 2011 for the period from 2012 to 2016).

The benchmark, i.e. the Nominal Return on Equity, is therefore found to be 18.05%.

Sub-step 2c: Calculation and comparison of financial indicators

For the financial analysis the main cash outflows are given by the investment, the ongoing O&M costs and other expenses, such as transmission tolls and taxes. The cash inflows are generated from revenues of electricity sales, which depends on power generation and the electricity tariffs established Renewable Energy Law Nr. 57-07 from May 2008 (for details see excel file "IRR Los Cocos II").

Input values for the investment analysis

Table 4 lists the parameters and values used for carrying out the investment analysis. All input values are based on information available at the time of investment decision, which is the 12/10/2011 (see Table 3). The main investment cost of the turbines and construction is 91,000,000 USD taken from the proposal of COBRA[31] (26/09/2011) and presented to the board[32] (04/10/2011) for final investment decision[33] on 12/10/2011. Additional investment costs (e.g. administrative costs, consultants, legal costs, etc.) are taken from the other project Los Cocos I. Since that project is only 25.2 MW, while this project has 52 MW, actual cost tends to be higher, which means that this assumption is conservative.

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[31] see "Proposal Cobra (26sept11).pdf"

[32] see "HIC-2011.10.04-Board_Presentation_Final.pdf"

[33] see "Resolución Los Cocos II (12Oct2011).pdf"

Some information with date after the decision making is used to compare the values from 12/10/2011 with other evidences in order to demonstrated appropriateness and make conservative assumptions. Detailed explanations of sources and such evaluations are provided in the excel spreadsheet “IRR Los Cocos II”.

Table 4. Input values used in the Investment Analysis available at the moment of decision making (all sources and calculations are provided in the Excel file “IRR Los Cocos II”).

GENERAL DESCRIPTION		
Electricity generation		
Generation (without losses)	162,000	MWh / year
Loss in medium voltage + auxiliary consumption	2.97%	(%)
Transformer losses	0%	(%)
Net generation for sale	157,189	MWh / year
Capacity Installed (MW)	52.00	MW
Number of Towers	26	
Capacity Generation	2.00	MW
Plant load factor (based on generation without losses)	35.6%	(%)
Plant load factor (based on net generation)	34.5%	(%)
Monomic Price (2008)	125.2	USD/MWh
Annual increase in Monomic Price (2009 - 2010)	4.00%	(%)
Annual increase in Monomic Price (2011)	1.64%	(%)
Annual increase in Monomic Price (2012 - 2018)	1.71%	(%)
Annual increase in Monomic Price (2019 - 2027)	0.71%	(%)
Transmission Tolls and Connection Right, year 2000 (USD/KWh)	6.000	USD/MWh
Transmission Tolls and Connection Right (year 2011)	7.091	USD/MWh
Increase in Transmission Tolls and Connection Right. (years 2012-over)	1.71%	(%)
INVESTMENT PARAMETERS AND TAXES		
Investment costs		
Turbines and construction[31]	$91,000,000	USD
Administration	$1,654,162	USD
Consultants	$2,122,000	USD
Studies	$475,428	USD
Legal consultants / Land	$2,438,383	USD
Supervision	$521,675	USD
Contingencies	$4,910,582	USD
Total Capital Investment Costs	**$103,122,230**	**USD**
Taxes		
Income Tax after exemption expires (%)	29%	(%)
Tax exemption	Up to 2020	
COSTS & EXPENSES		
Maintenance		
Interim fee	$884,989	USD/yr
Balance of Plant	$609,621	USD/yr
O&M fee	$1,823,160	USD/yr
Total O&M Costs	**$3,339,462**	**USD/yr**
Regulatory Payments (% of gross revenues)	1.00%	(%)
Depreciation		
Depreciation	15%	(%)
Project lifetime	20	years
MACROECONOMIC PARAMETERS		
CPI	1.71%	(%)
Currency exchange USD/EUR	$1.39	USD/EUR
Benchmark		
Benchmark		
Return on Equity (real terms)	13.75%	%
Inflation Adjustment	4.30%	%

BENCHMARK: Nominal Return on Equity		**18.05%**	**%**

Result of the investment analysis

Based on the parameters above, the Internal Rate of Return (equity IRR) is calculated as 14.90%, which is below the benchmark rate of 18.05%.

Sub-step 2d: Sensitivity analysis

A sensitivity analysis is carried out by varying the following key parameters to analyze the impact on the equity IRR:

- Energy generation (MWh): the complete energy generation is varied.
- Investment costs (USD): the complete investment cost is varied.
- O&M costs (USD/year): the complete O&M cost is varied.

The basis of the energy tariff is fixed through the Renewable Energy Law Nr. 57-07 from May 2008, which means that no significant variation is expected to occur.

The analysis in Table 5 shows that the variations of the key parameters do not result in any significant change of the IRR and that in those scenarios the IRR remains below the benchmark.

Table 5. For the sensitivity analysis each parameter is varied by ±10%.

Variation of electricity generation	**+10%**
IRR	**17.33%**
Variation of electricity price	**+10%**
IRR	**17.46%**
Variation of investment costs	**-10%**
IRR	**15.40%**
Variation of O&M costs	**-10%**
IRR	**17.06%**

Moreover, the following should be taken into account:

- Electricity generation: An average increase of +10% is very unlikely to happen since the projected energy generation is based on extensive wind measurements. Annual positive and negative variations are likely, but the variation of the long-term average is likely to be small. Even with a variation of 10%, the benchmark would not be reached.
- Electricity price: the electricity prices for renewable energy generation are established through the "Regulation for the application of the Renewable Energy Law Nr. 57-07" from May 2008 (see "Reglamento Ley no. 57-07.pdf", Chapter 8. Articles 108, 109 and 110 on page 52). Substantial changes are therefore very unlikely to occur. Even with a variation of 10%, the benchmark would not be reached.
- Investment costs: The turbine and construction costs (91 million USD) already represents more than 88% of the estimated total costs of 103 million USD. However, it is clear that the other items (e.g. administration, legal consultants, land costs) also require a considerable investment. Those other costs are taken from another project (Los Cocos) which is only about half of the project activity size, thus already making a conservative assumption. Therefore a reduction of 10% of the total investment costs is very unlikely. Even with a variation of 10%, the benchmark would not be reached.
- O&M costs: These ongoing costs are preliminary estimated based on the O&M agreement of Los Cocos (the earlier CDM project, currently under validation), which provides O&M costs per turbine and a general cost for the plant (Balance of Plant). However, Los Cocos has only about half of the capacity installed, which means that Los Cocos II actually would

have higher general costs. Besides, Los Cocos has smaller turbines (1.8 MW) than Los Cocos II (2.0 MW); thus O&M costs per turbine in this project activity in fact would increase. For these reasons, the assumptions for O&M costs are already conservative and a further reduction of 10% is very unlikely to happen. Even with a variation of 10%, the benchmark would not be reached.

Therefore, it can be concluded that the project activity is not financially attractive.

Step 3: Barrier analysis

No barrier analysis is carried out.

Step 4: Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

Sub step 4a requires providing an analysis of any other activities that are operational and that are similar to the proposed project activity. Article 47 of the *"Tool for the demonstration and assessment of additionality"* (version 06.0.0) sets forth a set of steps applicable to measures listed in paragraph 6 of the Tool. Renewable electricity generation falls within paragraph 6(b), so that the Steps defined in Article 47 may be applied, as undertaken below:

Step 1. Calculate applicable output range as +/- 50% of the design output or capacity of the proposed project activity.

The total capacity of the proposed project activity is 52 MW. Therefore, the range is between 26 MW and 78 MW.

Step 2. In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM Project activities shall not be included in this step.

Based on the available information from the Coordinating Organization (Organismo Coordinador – OC)[34] and the project start date (29/12/2012), there are 20 operational power plants in the host country with similar capacity, i.e. within the range determined in step 1. These plants are presented in **Table 6**.

Table 6: Plants identified in the host country with similar capacity in step 2 (N_{all} = 20) and those that apply technologies different that the technology applied in the proposed project activity as per step 3 (N_{diff} = 20). For the complete analysis, see Excel file "*Common Practice Los Cocos II*"

Power Plant	Technology	Capacity [MW]	Step 2: N_{all} (within +/-50%)	Step 3: N_{diff} (different technology)
Aguacate	Hydroelectric Plant	52	x	x
Barahona Carbón	Steam Turbines	53.6	x	x
CEPP 2	Diesel Engines	58.1	x	x
Estrella del Mar	Diesel Engines	73.3	x	x
Estrella del Norte	Diesel Engines	43	x	x
Falcondo 1	Thermal (not specified)	66	x	x
Falcondo 2	Thermal (not specified)	66	x	x
Falcondo 3	Thermal (not specified)	66	x	x
Haina 1	Steam Turbines	54	x	x

[34] see Annual Report 2010 (OC-SENI Memoria Annual 2010) pg. 35 (*Memoria 2010 OC.pdf*) and Monthly Operational Report January 2012 (Informe Mensual de Operación Real Enero 2012), pg. 22/23 (*OCGO-IOPERACION January 12.pdf*)

Power Plant	Technology	Capacity [MW]	Step 2: N_{all} (within +/-50%)	Step 3: N_{diff} (different technology)
Haina 2	Steam Turbines	54	x	x
Metaldom	Diesel Engines	42	x	x
Monción	Hydroelectric Plant	52	x	x
Pimentel 1	Diesel Engines	31.6	x	x
Pimentel 2	Diesel Engines	28	x	x
Pimentel 3	Diesel Engines	51.4	x	x
Pinalito	Hydroelectric Plant	50	x	x
Puerto Plata 1	Steam Turbines	27.6	x	x
Puerto Plata 2	Steam Turbines	39	x	x
San Pedro Vapor	Steam Turbines	30	x	x
Valdesia	Hydroelectric Plant	54	x	x

Therefore $N_{all} = 20$.

Step 3. Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

In **Table 6**, it is summarized which of the plant with similar capacity apply a different technology than the technology applied in the proposed project activity. As can be observed, there is no operational wind power project connected to the SENI with a similar capacity than the project activity[35]. All other power plants are thermal or hydroelectric power plants; therefore $N_{diff} = 20$.

Step 4. Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

The proposed project activity is a common practice within a sector in the applicable geographical area if both the following conditions are fulfilled: (a) the factor F is greater than 0.2, and (b) N_{all}-N_{diff} is greater than 3.

Based on the results of steps 2 and 3, the results for the project case are:

$$F = 1 - \frac{N_{diff}}{N_{all}} = 1 - \frac{20}{20} = 0.0 < 0.2$$

$N_{all} - N_{diff} = 20 - 20 = 0$

Thus, it can be concluded that the proposed project activity is not a common practice.

Sub-step 4b: Discuss any similar options that are occurring

As shown in the analysis in sub-step 4a above, there are no similar activities that are occurring. There are four other wind power plants under development (Quilvio Cabrera, Los Cocos, Matafango, El Guanillo), but they are not relevant as per the tool for additionality, since they did not yet start commercial operation at the moment of the project activity start date. Moreover, El Guanillo and Matafango were already registered as CDM project activities (PDDs are available on UNFCCC website), Quilvio Cabrera requested CDM registration recently and Los Cocos is under validation. Since wind power plants are still costly and a completely new practice in the SENI, it is clear that this energy resource requires the financial incentives from the CDM in order to be economically attractive.

[35] Cocos I is not considered since it had not yet started commercial operation at the starting date of the project, see Executive Summary of the Monthly Operational Report January 2012, pg. 5 (*OCGO-IOPERACION January 12.pdf*)

<u>Conclusion of the additionality analysis</u>

Since the project activity is not financially attractive (step 2) and the common practice analysis shows that it is not business-as-usual (step 4), the proposed project activity is additional.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

Project emissions

According to ACM0002 version 12.3.0 project emissions (PE_y) for wind farms are zero.

Then, $\boldsymbol{PE_y = 0}$

Baseline emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$\boldsymbol{BE_y = EG_{PJ,y} \times EF_{grid,CM,y}}$$ (Equation 6, ACM0002 v.12.3.0)

Where:

BE_y = Baseline emissions in year y (tCO_2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "*Tool to calculate the emission factor for an electricity system*" , version 02.2.1, (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$\boldsymbol{EG_{PJ,y} = EG_{facility,y}}$$ (Equation 7, ACM0002 v.12.3.0)

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

$EG_{PJ,y}$ will be calculated as the sum of the quantity of net electricity generation supplied by the project plant/unit to the grid in each hour h ($EG_{PJ,h}$) during one year.

The project activity will deliver electricity to a 138/34.5 kV substation, which will deliver electricity to the SENI grid. The substation will also receive electricity from Los Cocos, and Quilvio Cabrera Wind Farms (see **¡Error! No se encuentra el origen de la referencia.**). Thus, the measurement

of the Commercial Measurement System (SMC) at the 138/34.5 kV substation performed by meters SMC TR01, TR02, TR03 and TR04, represents the net energy delivered to the grid by Los Cocos Wind Farm and Quilvio Cabrera Wind Farm, as well as Los Cocos II Wind Farm (proposed project activity). It is important to clarify that even though Larimar Wind Farm is part of the whole eolic system as can be seen in the figure, the data reported is shown independently from the generations of Quilvio Cabrera, Los Cocos and Los Cocos II Wind Farms. Then it is possible to manage Larimar as an independent wind farm, since there is measurement equipment recognized by the OC-SENI on the side of 34.5 kV for lines L10 and L11.

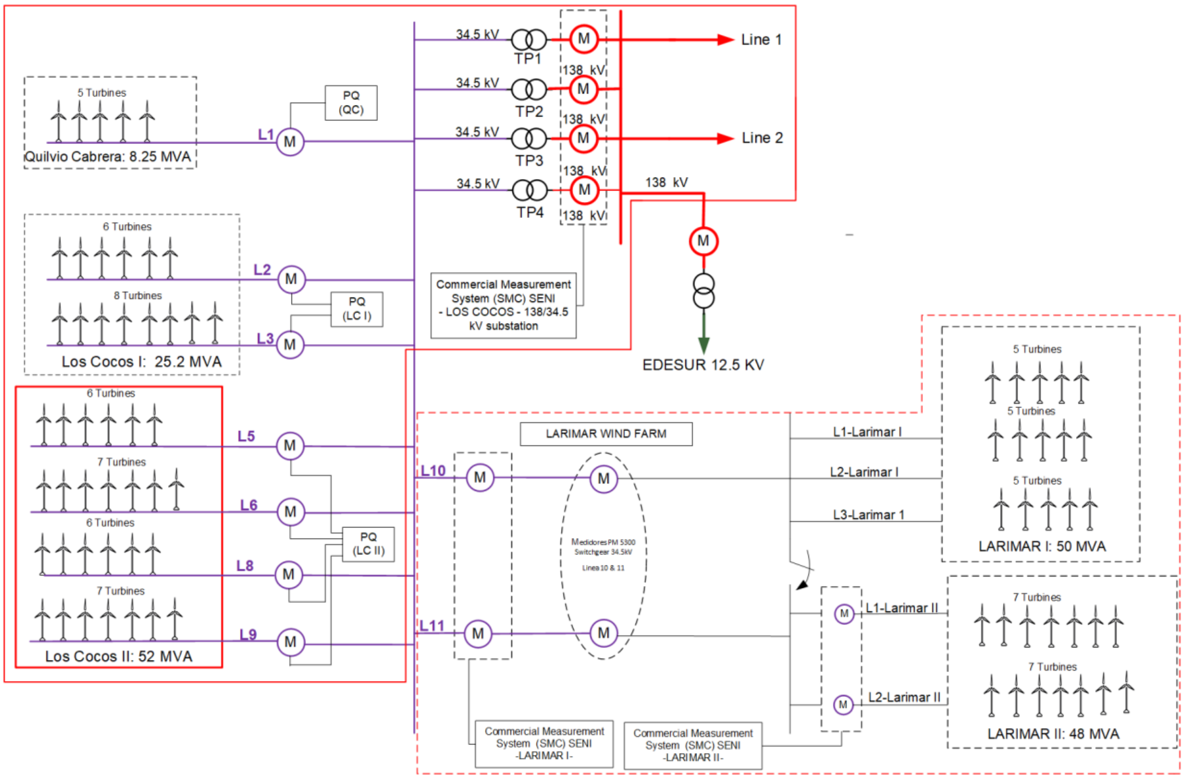

Figure 13. The electricity generated by Los Cocos II is measured by the PQube (LCII) equipment which adds the energy generated by wind turbines connected to L5, L6, L8 and L9 at each of four 34.5 kV lines. This electricity, together with the generation from Quilvio Cabrera and Los Cocos Wind Farms, two other CDM projects, are transformed to 138 kV before being supplied to the Dominican National Power Grid, SENI.

The quantity of net electricity supplied to the grid by the proposed project activity in hour *h* ($EG_{PJ,h}$) will be calculated multiplying the value of the measurement of the Commercial Measurement System (SMC) at the 138/34.5 kV substation ($EG_{SMC,h}$) by the proportion of the electricity generated by Los Cocos II Wind Farm at each hour *h* ($K_{LCII,h}$). This value represents the net electricity delivered to the grid by Los Cocos II Wind Farm, and is calculated as follows:

$$EG_{PJ,h} = EG_{SMC,h} \times K_{LCII,h} \qquad \text{(Additional equation 1)}$$

Where,

$EG_{SMC,h}$ = Quantity of net electricity supplied to the grid at Commercial Measurement System (SMC) point at the 138/34.5kV substation by Los Cocos Wind Farm, Quilvio Cabrera Wind Farm and Los Cocos II Wind Farm in hour *h* (MWh/h). Measurement points are identified as SMC TR01, TR02, TR03 and TR04.

$K_{LCII,h}$ = Proportion of the electricity generated by Los Cocos II Wind Farm in hour *h* (ad), taking into account transformation losses to be able to handle similar voltage levels (From 34.5 kV to 138 kV- network delivery point $EG_{SMC,h}$).

The proportion of the electricity generated by Los Cocos II Wind Farm in hour *h* ($K_{LCII,h}$) is calculated dividing the hourly value of the total net electricity generated by Los Cocos II Wind Farm measured at the 34.5 kV lines (measurement of the four lines L5-L6-L8-L9) by the hourly value of the total net electricity generated by Los Cocos - PQ(LCI), Quilvio Cabrera – PQ(QC), and Los Cocos II – PQ(LCII) Wind Farms, measured at the 34.5 kV lines, as shown in **¡Error! No se encuentra el origen de la referencia.**. Thus, $K_{LCII,h}$ is calculated as follows:

$$K_{LCII,h} = \frac{(EG_{PQ(LCII),L5+L6+L8+L9,h})}{(EG_{PQ(QC),L1,h}+EG_{PQ(LCI),L2+L3,h}+EG_{PQ(LCII),L5+L6+L8+L9,h})}$$ (Additional equation 2)

Where:

$EG_{PQ(LCII),L5+L6+L8+L9,h}$ = Quantity of net electricity generated by Los Cocos II Wind Farm measured by the PQ(LCII) equipment at the 34.5 kV line, as the sum of four lines, L5-L6-L8-L9, in hour *h* (MWh/h).

Since the electricity measurement is calculated by means of measurements at 138kV ($EG_{SMC,h}$) and also 34.5 kV ($EG_{PQ(LCII),\ L5+L6+L8+L9,h}$). Transformation losses at the delivery point for electricity generation 138/34.5 kV substation are taken into account, applying the following transformation losses equation to Los Cocos II generation data ($EG_{PQ(LCII),\ L5+L6+L8+L9,h}$).

$$E(h)_{138\ kV}|LCII = E(h)_{34.5\ kV}|LCII - [53.22 + 0.003988 \times E(h)_{34.5\ kV}|LCII]$$

$EG_{PQ(LCI),L2+L3,h}$ = Quantity of net electricity generated by Los Cocos Wind Farm measured by the PQ(LCI) equipment at the 34.5 kV line, as the sum of two lines L2 and L3, in hour *h* (MWh/h).

Since the electricity measurement is calculated by means of measurements at 138kV ($EG_{SMC,h}$) and also 34.5 kV ($EG_{PQ(LCI),\ L2+L3,h}$). Transformation losses at the delivery point for electricity generation 138/34.5 kV substation are taken into account, applying the following transformation losses equation to Los Cocos I generation data ($EG_{PQ(LCI),\ L2+L3,h}$).

$$E(h)_{138\ kV}|LCI = E(h)_{34.5\ kV}|LCI - [25.59 + 0.003988\ \times E(h)_{34.5\ kV}|LCI]$$

$EG_{PQ(QC),L1,h}$ = Quantity of net electricity generated by Quilvio Cabrera Wind Farm measured by the PQ(QC) equipment at the 34.5 kV line, as a single line L1, in hour *h* (MWh/h).

Since the electricity measurement is calculated by means of measurements at 138kV ($EG_{SMC,h}$) and also 34.5 kV ($EG_{PQ(QC),L1,h}$). Transformation losses at the delivery point for electricity generation 138/34.5 kV substation are taken into account, applying the following transformation losses equation to Quilvio Cabrera generation data ($EG_{PQ(QC),L1,h}$).

$$E(h)_{138\ kV}|QC = E(h)_{34.5\ kV}|QC - [8.44 + 0.003988\ \times E(h)_{34.5\ kV}|QC]$$

Leakage

As per ACM0002, version 12.3.0:
“No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.”

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$ (Equation 11, ACM0002 v.12.3.0)

Where:

ER_y = Emission reductions in year y (tCO_2e)

BE_y = Baseline emissions in year y (tCO_2e)

PE_y = Project emissions in year y (tCO_2e)

Calculation of the combined margin CO_2 emission factor for grid connected power generation in year y ($EF_{grid,CM,y}$)

Following the methodology ACM0002 version 12.3.0, the combined margin CO_2 emission factor for grid connected power generation in year y ($EF_{grid,CM,y}$) is calculated using the latest version of the "*Tool to calculate the emission factor for an electricity system*" (version 02.2.1).

The combined margin emission factor ($EF_{CM,y}$) consists of the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$), as detailed in below.

According to the "*Tool to calculate the emission factor for an electricity system*" version 02.2.1, project participants shall apply the following six steps:

- STEP 1. Identify the relevant electricity systems.
- STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).
- STEP 3. Select a method to determine the operating margin (OM).
- STEP 4. Calculate the operating margin emission factor according to the selected method.
- STEP 5. Calculate the build margin emission factor.
- STEP 6. Calculate the combined margin (CM) emissions factor.

Step 1: Identify the relevant electricity systems

For determining the electricity emission factors, a **project electricity system** is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

The relevant electricity system for the proposed project activity is the National Interconnected Electricity System of Dominican Republic (SENI).

Step 2: Choose whether to include off-grid power plants in the project electricity system

Since information from power generation is available for grid connected power plants and the dispatch data analysis for the calculation of the $EF_{grid,OM,y}$ is used, in order to calculate the operating margin and build margin emission factor only grid power plants are included in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($\boldsymbol{EF_{grid,OM,y}}$) is based on option (c) of the "*Tool to calculate the emission factor for an electricity system*" version 02.2.1: ***Dispatch data analysis OM.***

Since this method analyzes the hourly generation of the plants connected to the SENI and their order of merit, the dispatch data analysis provides a more realistic analysis of the electricity displaced by the proposed project activity, and thus, the emission reductions generated by the proposed project activity. The required information to perform this analysis is publicly available at the Coordinating Organization (OC) web site (www.oc.org.do).

This approach is not applicable to historical data and, thus, requires annual monitoring of $\boldsymbol{EF_{grid,OM,y}}$. The emission factor will be calculated *ex post*, determined for the year in which the project activity displaces grid electricity, and will be updated annually during monitoring.

Step 4: Calculate the operating margin emission factor according to the selected method

(c) Dispatch data analysis OM

The dispatch data analysis OM emission factor ($\boldsymbol{EF_{grid,OM\text{-}DD,y}}$) is determined based on the grid power units that are actually dispatched at the margin during each hour *h* where the project is displacing grid electricity.

Since $\boldsymbol{EF_{grid,OM\text{-}DD,y}}$ is not applicable to historical data and, thus, must be calculated *ex post* and adjusted on an annual basis, in order to estimate *ex ante* emission reductions, historical data has been applied to calculate an ex ante $\boldsymbol{EF_{grid,OM\text{-}DD,y}}$, which is necessary for the *ex ante* estimation of $\boldsymbol{BE_y}$

The emission factor is calculated as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \times EF_{EL,DD,h}}{EG_{PJ,y}}$$

(Equation 9, *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1)

Where:

$\boldsymbol{EF_{grid,OM\text{-}DD,y}}$ = Dispatch data analysis operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

$\boldsymbol{EG_{PJ,h}}$ = Electricity displaced by the project activity in hour *h* of year *y* (MWh)

$\boldsymbol{EF_{EL,DD,h}}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh)

$\boldsymbol{EG_{PJ,y}}$ = Total electricity displaced by the project activity in year *y* (MWh)

h = Hours in year *y* in which the project activity is displacing grid electricity

y = Year in which the project activity is displacing grid electricity

The hourly emissions factor is determined as follows:

$$EF_{EF,DD,h} = \frac{\sum_{i,n} FC_{i,n,h} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum_n EG_{n,h}}$$

(Equation 10, *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1)

Where:

$\boldsymbol{EF_{EL,DD,h}}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh)

$\boldsymbol{FC_{i,n,h}}$ = Amount of fossil fuel type *i* consumed by grid power unit *n* in hour *h* (Mass or volume unit)

$\boldsymbol{NCV_{i,y}}$ **=** Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)

$\boldsymbol{EF_{CO2,i,y}}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)

$\boldsymbol{EG_{n,h}}$ = Electricity generated and delivered to the grid by grid power unit *n* in hour *h* (MWh)

n = Grid power units in the top of the dispatch (as defined below)

i = Fossil fuel types combusted in grid power unit *n* in year *y*

h = Hours in year *y* in which the project activity is displacing grid electricity

y = Year in which the project activity is displacing grid electricity

Since hourly fuel consumption data of the power plants connected to the SENI is not publicly available, hourly fuel consumption data is calculated based on each plant's hourly generation and fossil fuel consumption rate.

To determine the set of grid power units ***n*** that are in the top of the dispatch, the following steps are applied:

i. At each hour *h*, each grid power unit's electricity generation is stacked using the merit order of the grid.
ii. The group of grid power units *n* in the dispatch margin includes the units in the top x% of total electricity dispatched in the hour *h*, where x% is equal to the greater of either:
    a. 10%; or
    b. The quantity of electricity displaced by the project activity during hour *h* divided by the total electricity generation by grid power plants during that hour *h* (%).

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, the project participant has chosen option 1 of the "*Tool to calculate the emission factor for an electricity system"* (version 02.2.1):

Option 1: For the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

The sample group of power units *m* used to calculate the build margin is determined as per the procedure presented in the "*Tool to calculate the emission factor for an electricity system"* (version 02.2.1), consistent with the data vintage selected above, as follows:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);

b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});
Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Otherwise:

d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that

unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM,}$ in MWh);
If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET-sample-CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

e) Include in the sample group $SET_{sample-CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample-CDM->10yrs}$).

The build margin emissions factor ($\boldsymbol{EF_{grid,BM,y}}$) is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available. $\boldsymbol{EF_{grid,BM,y}}$ is calculated applying equation 13 of the "*Tool to calculate the emission factor for an electricity system*" version 02.2.1, as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

(Equation 12, *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1)

Where:

$\boldsymbol{EF_{grid,BM,y}}$ = build margin CO_2 emission factor in year *y* (tCO_2/MWh)

$\boldsymbol{EG_{m,y}}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

$\boldsymbol{EF_{EL,m,y}}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

Since electricity generation, net calorific value and specific fuel consumption of the plants connected to the SENI is publicly available in Dominican Republic, the CO_2 emission factor of each power unit *m* ($\boldsymbol{EF_{EL,m,y}}$) is determined as per the guidance in Step 4 (a) for the simple OM, using option A1, based on the total net electricity generation of the *m* the power units included in the build margin, the fuel types and total fuel consumption of each plant; using for *y* the most recent historical year for which power generation data is available. The total fuel consumption was estimated based on the specific consumption.

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

(Equation 2, *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1)

Where:

$\boldsymbol{EF_{EL,m,y}}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)

$\boldsymbol{FC_{i,m,y}}$ = Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit)

$\boldsymbol{NCV_{i,y}}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

m = All power units serving the grid in year *y* except low-cost/must-run power units

***i* =** All fossil fuel types combusted in power unit *m* in year *y*

y = The relevant year as per the data vintage chosen in Step 3

Step 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

According to the *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1, the weighted average CM method (option A) should be used as the preferred option. Thus, option A is chosen.

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

(Equation 13, *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1)

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

w_{OM} = Weighting of operating margin emissions factor (%)

w_{BM} = Weighting of build margin emissions factor (%)

According to the tool, wind and solar power generation project activities should apply the following values of w_{OM} and w_{BM} for the first crediting period and for subsequent crediting periods:

w_{OM} = 0.75 and **w_{BM} = 0.25**

B.6.2. Data and parameters fixed ex ante

Data/Parameter	***$NCV_{i,y}$***
Data unit	TJ/ktonne
Description	Net calorific value (energy content) of fossil fuel type i in year y
Source of data	NCV for fuel oil (kJ/Gal) and coal (kJ/kg) is obtained from the SENI Coordinating Organization (OC) weekly reports: "*Estado de la Información Correspondiente a la Programación Semanal*". Sheet: "*Costos Variables de Producción".* Fuel oil is converted from kJ/Gal to TJ/ktonne by dividing the value in kJ/Gal by the fuel density (in gr/lt) and by 3.7854 lt/gal. Coal is converted to TJ/ktonne dividing the value in kJ/kg by 1000. Since the OC does not publish NCV of Natural Gas, the value was estimated using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2, Chapter 1. Table 1.2 (IPCC, 2006). IPCC default values at the lower limit of the uncertainty at a 95% confidence interval.
Value(s) applied	For Natural Gas: 46.5 TJ/ktonne For Coal and Fuel Oil Nr. 2 and 6 please refer to the spreadsheets in *Ex Ante Hourly Data - SENI.rar*
Choice of data or measurement methods and procedures	Whenever available country specific NCV figures for fuels were applied. For Natural Gas since there are not available country specific NVC, then 2006 IPCC default figures were used. Country specific NCV for fuels Coal and Fuel Oil are updated weekly. The values will be monitored annually for the year *y* in which the project activity is displacing grid electricity.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data/Parameter	***$EF_{CO2,i,y}$*** and ***$EF_{CO2,m,i,y}$***
Data unit	tCO_2/TJ
Description	CO_2 emission factor of fossil fuel type *i* used in power unit *m* in year *y*
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories, Reference Manual, Volume 2 (2006), chapter 1. Table 1.4. (IPCC, 2006). IPCC default values at the lower limit of the uncertainty at a 95% confidence interval
Value(s) applied	see table below
Choice of data or measurement methods and procedures	Since country specific emission factors for fuels are not available, IPCC default figures were used.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Fuel	Value	Unit	Source
Coal	89.5	tCO_2/TJ	IPCC, 2006
Natural Gas	54.3	tCO_2/TJ	IPCC, 2006
Fuel Oil Nr. 2	72.6	tCO_2/TJ	IPCC, 2006
Fuel Oil Nr. 6	75.5	tCO_2/TJ	IPCC, 2006

Data/Parameter	$EG_{m,y}$, EG_y, and $EG_{n,h}$
Data unit	MWh
Description	Net electricity generated by power plant/unit *m* or *n* (or in the project electricity system in case of EG_y) in year *y* or hour *h*
Source of data	Official publications from the Coordinating Organization (OC) http://www.oc.org.do/
Value(s) applied	Please refer to spreadsheets in *Ex Ante Hourly Data - SENI.rar*
Choice of data or measurement methods and procedures	The OC records present the best available and verifiable information.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data/Parameter	$FC_{i,m,y}$ and $FC_{i,n,h}$
Data unit	Tonnes
Description	Amount of fossil fuel type *i* consumed by power unit *m* or *n* in year *y* or hour *h*
Source of data	Calculated based on specific fuel consumption and electricity generation. Specific fuel consumption is obtained from official publications from the Coordinating Organization (OC) http://www.oc.org.do/
Value(s) applied	Please refer to spreadsheets in *Ex Ante Hourly Data - SENI.rar*
Choice of data or measurement methods and procedures	The OC records present the best available and verifiable information.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data/Parameter	$EF_{grid, CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using version 02.2.1 of the "Tool to calculate the emission factor for an electricity system".
Source of data	Calculated as per the "*Tool to calculate the emission factor for an electricity system*" version 02.2.1.
Value(s) applied	0.716 tCO_2/MWh
Choice of data or measurement methods and procedures	The Combined Margin is a weighted average of Operating Margin and Build Margin, as indicated by Eq. 14 of *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1. The Operating Margin emission factor was calculated, from dispatch analysis data, using a model developed by the project owner, which processes the hourly information of the merit order and the electricity generation of the plants connected to the SENI grid. The Build Margin was calculated for the set of grid power capacity additions in the SENI electricity system that comprise 20% of the system generation and that have been built most recently, as indicated in Eq. 13 of *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1.
Purpose of data	Calculation of baseline emissions
Additional comment	None

B.6.3. Ex ante calculation of emission reductions

As mentioned in section B.6.1, no project emissions neither leakage emissions from the proposed project activity should be considered. Thus, if PE_y = 0 and applying equation 11 of ACM0002 version 12.3.0, emission reductions are calculated as follows:

$$ER_y = BE_y$$

Baseline emissions are calculated applying equation 6 of ACM0002 version 12.3.0:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where $EG_{PJ,y} = EG_{facility,y}$

Since at the time of presenting this PDD for validation the Los Cocos II Wind Farm is under construction, the value of $EG_{PJ,y}$ was estimated *ex ante* based on the wind farm installed capacity and the estimated plant load factor.

The *ex ante* value of $EG_{PJ,y}$ is **157,189 MWh/yr** as provided by a third-party generation study[36]**.**

As detailed in section B.6.1 of this PDD, the combined margin grid emission factor for year y ($EF_{grid,CM,y}$) is calculated applying the dispatch analysis method, as described in the following paragraphs.

Step 1: Identify the relevant electricity systems

As mentioned in section B.6.1., the relevant electricity system for the propose project activity is the National Interconnected Electricity System of Dominican Republic (SENI).

Step 2: Choose whether to include off-grid power plants in the project electricity system

In order to calculate the operating margin and build margin emission factor only grid power plants are included in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The method selected for the calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is option (c) of the "*Tool to calculate the emission factor for an electricity system*" version 02.2.1: ***Dispatch data analysis OM.*** This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM,y}$. The emission factor will be calculated *ex post*, determined for the year in which the project activity displaces grid electricity, and will be updated annually during monitoring.

Step 4: Calculate the operating margin emission factor according to the selected method
(c) Dispatch data analysis OM

Since $EF_{grid,OM-DD,y}$ is not applicable to historical data and, thus, must be calculated *ex post* and adjusted on an annual basis, in order to estimate *ex ante* emission reductions, historical data has been applied to calculate an ex ante $EF_{grid,OM-DD,y}$.. Data for the year prior to the submission of this CDM-PDD has been collected and applied for the calculation of the $EF_{grid,OM-DD,y}$ and the $EF_{grid,BM,y}$. The period evaluated was January 2011 to December 2011.

$EF_{grid,OM-DD,y}$ was calculated applying equation 9 of the *"Tool to calculate the emission factor for an electricity system"* (version 02.2.1), as follows:

[36] see wind study "120208 Garrad Hassan.pdf"

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \times EF_{EL,DD,h}}{EG_{PJ,y}}$$

The electricity displaced by the project activity in hour *h* of year *y* (***EG****PJ,h*) was estimated based on the estimated annual power generation of the wind farm. The applied hourly generation for ex ante estimation is 17.94 MWh (= 157,189 MWh / 8760)[37].

The calculation of $EF_{grid,OM-DD,y}$ is presented in the excel spreadsheet "ER Los Cocos II". The results are not presented in this PDD since 8760 values were calculated.

The CO_2 emission factor for grid power units in the top of the dispatch order in hour *h* in year *y* ($EF_{EL,DD,h}$) is determined as applying equation 10of the *"Tool to calculate the emission factor for an electricity system"* (version 02.2.1), as follows:

$$EF_{EL,DD,h} = \frac{\sum_{i,n} FC_{i,n,h} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum_n EG_{n,h}}$$

Since hourly fuel consumption data of the power plants connected to the SENI is not publicly available, hourly fuel consumption data is calculated based on each plant's hourly generation and fossil fuel consumption rate. The fossil fuel consumption rate of each plant, the type of fuel used and the net calorific value of each fuel is published on a weekly basis by the Coordinating Organization (OC)[38]. These reports are available at the OC web site (www.oc.org.do).

Since there are no publicly available country specific CO_2 emission factors of fossil fuels, the CO_2 emission factor of each fossil fuel is estimated based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, as detailed in section B.7.1.

The grid system dispatch order of operation and the electricity generated and delivered to the grid by each grid power unit in the system during each hour *h* that the project activity is displacing electricity, is obtained from the OC daily operation reports, publicly available at the OC website[39].

To determine the set of grid power units ***n*** that are in the top of the dispatch, the following steps are applied:

i. At each hour *h*, each grid power unit's electricity generation is stacked using the merit order of the grid.
ii. The group of grid power units *n* in the dispatch margin includes the units in the top x% of total electricity dispatched in the hour *h*, where x% is equal to the greater of either:
    a. 10%; or
    b. The quantity of electricity displaced by the project activity during hour *h* divided by the total electricity generation by grid power plants during that hour *h* (%).

For the *ex ante* estimation of emission reductions from the proposed project activity, the information required for the calculation of the dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) was gathered and processed by a model developed by EGE HAINA, which applies the equations presented above. During the implementation of the project activity, the calculation of $EF_{grid,OM-DD,y}$ will be done using the same model.

This model consists on an excel worksheet which contains a macro that incorporates and processes data on hourly electricity generation by the plants connected to the SENI, and specific fuel consumption. Hourly dispatch data from the plants connected to the SENI, their merit order

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37 Hourly value is rounded in the PDD to two decimals, but used more precisely in the calculation sheets.

38 SENI Coordinating Organism (OC). Weekly reports. "ESTADO DE LA INFORMACIÓN CORRESPONDIENTE A LA PROGRAMACIÓN SEMANAL". Sheet: "Costos Variables de Producción".

39 http://www.oc.org.do/ (Informe diario de Operación)

and specific fuel consumption is publicly available at the OC website. This information is obtained by HAINA´s Commercial Department on a daily basis. For every day and on an hourly basis, the model calculates the accumulated electricity generation of the grid power units in the top of the dispatch order, until 10% of the total SENI generation is reached. At that percentage of generation, the fuel consumption of the involved plants is calculated based on the specific fuel consumption data. Then, the hourly emission factor of the grid power units in the top of the dispatch order is obtained applying equation 10, by dividing the CO_2 emissions (calculated based on the fossil fuel consumption of the group of *n* plants, their net calorific value and the fossil fuel emission factors) by the electricity generation of the group of *n* plants. The *ex ante* calculations are presented in 12 excel files called:

January 2011:	*Factor Emisiones 11 01 (Ene) CE.xlsm*
February 2011:	*Factor Emisiones 11 02 (Feb) CE.xlsm*
March 2011:	*Factor Emisiones 11 03 (Mar) CE.xlsm*
April 2011:	*Factor Emisiones 11 04 (Abr) CE.xlsm*
May 2011:	*Factor Emisiones 11 05 (May) CE.xlsm*
June 2011:	*Factor Emisiones 11 06 (Jun) CE.xlsm*
July 2011:	*Factor Emisiones 11 07 (Jul) CE.xlsm*
August 2011:	*Factor Emisiones 11 08 (Ago) CE.xlsm*
September 2011:	*Factor Emisiones 11 09 (Sep) CE.xlsm*
October 2011:	*Factor Emisiones 11 10 (Oct) CE.xlsm*
November 2011:	*Factor Emisiones 11 11 (Nov) CE.xlsm*
December 2011:	*Factor Emisiones 11 12 (Dic) CE.xlsm*

. Each worksheet contains the processed information for one month.

In order to obtain the dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$), the hourly emission factor of the grid power units in the top of the dispatch order is then multiplied by the hourly electricity generation of the proposed project activity. The sum of this product for a whole year is divided by the net electricity generation produced and fed into the grid by the project activity for a whole year, according to equation 10 of the *"Tool to calculate the emission factor for an electricity system"* (version 02.2.1).

For the *ex ante* estimation, $EF_{grid,OM-DD,y}$ was calculated based on information processed for the most recent year at the moment of validation (i.e. year 2011) , applying the model described above. The estimated *ex ante* $EF_{grid,OM-DD,y}$ is 0.809 tCO_2e/MWh. For further detail in this calculation please refer to the monthly calculation sheets mentioned above and the Excel worksheet "ER Los Cocos II".

Step 5: Calculate the build margin (BM) emission factor

The sample group of power units *m* used to calculate the build margin was determined as per the procedure presented in the "*Tool to calculate the emission factor for an electricity system"* (version 02.2.1). The following steps have been taken:

a) The set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) has been identified and their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh) has been determined;

b) The annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh) has been determined. In addition the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} ($SET_{\geq 20\%}$) has been identified and their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh) has been determined;

c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ the set of power units that comprises the larger annual electricity generation (SET_{sample}) has been selected.
The sample group of power units *m* used to calculate the build margin (SET_{sample}) consists of the set of power units, excluding power units registered as CDM project activities, that started

to supply electricity to the grid most recently and that comprise 20% of AEG_{total} ($SET_{\geq 20\%}$). This set of power units comprises a larger annual generation than the set of five power units that have been built most recently.
The date when the power units in SET_{sample} started to supply electricity to the grid has been identified.

Steps (d), (e) and (f) are ignored since none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago.

The following table shows the set of power units used to calculate the build margin. The selection is based on the available information at the time of the CDM-PDD submission to the DOE for validation.

Table 7: Set of power units included in the calculation of the build margin (SET_{sample}). The data refer to year 2011.

Company	Plant / Unit	Type of Fuel	Start of operations Month	- Year	Generation (GWh)	Accumulated Generation (GWh)	%
LAESA	Pimentel 3	Fuel Oil Nr. 6	September	2010	358.61	358.61	2.76%
LAESA	Pimentel 2	Fuel Oil Nr. 6	September	2009	156.56	515.17	3.97%
EGEHID	Pinalito 1 & 2	Hydroelectric	August	2009	126.97	642.14	4.95%
EGEHID	Las Barias	Hydroelectric	April	2009	5.22	647.36	4.99%
EGEHID	Magueyal 1 & 2	Hydroelectric	October	2008	10.96	658.32	5.07%
CDEEE	Rio San Juan	Fuel Oil Nr. 2	June	2008	9.82	668.14	5.15%
LAESA	Pimentel 1	Fuel Oil Nr. 6	October	2006	183.98	852.12	6.56%
EGEHID	Rosa Julia de la Cruz	Hydroelectric	N/A	2006	1.59	853.71	6.58%
EGEHID	Domingo Rodriguez 1 & 2	Hydroelectric	August	2004	15.22	868.93	6.69%
AES ANDRES	AES Andrés	Natural Gas	June	2003	2,072.22	2,941.15	**22.66%**

Total generation 2011 (AEG_{total})	**12,980.00 GWh**
20% of generation in 2011	**2,596.00 GWh**

The build margin emissions factor ($EF_{grid,BM,y}$) is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available. $EF_{grid,BM,y}$ is calculated applying equation 12 of the "*Tool to calculate the emission factor for an electricity system*" version 02.2.1, as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) is determined based on the total net electricity generation of the *m* the power units included in the build margin, the fuel types and total fuel consumption of each plant; using for *y* the most recent historical year for which power generation data is available. The total fuel consumption was estimated based on the specific consumption.

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Since annual fuel consumption data of the power plants connected to the SENI is not publicly available, annual fuel consumption data is calculated based on each plant's annual generation and fossil fuel consumption rate. The fossil fuel consumption rate of each plant, the type of fuel used and the net calorific value of each fuel is published on a weekly basis by the Coordinating Organization (OC)[40]. These reports are available at the OC web site (www.oc.org.do). The value of the mentioned parameters was estimated as the average of the weekly values of one year, considering the values of the first week of the month during 12 months.

Since there are no publicly available country specific CO_2 emission factors of fossil fuels, the CO_2 emission factor of each fossil fuel is estimated based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, as detailed in section B.7.1.

The electricity generated and delivered to the grid by each grid power unit in the system for one year was obtained from the OC monthly operation reports, publicly available at the OC website[41]. Data from the period January 2011 to December 2011 has been analyzed.

Table 8: Estimation of the CO_2 emission factor of the power plants included in the build margin. The reference year is 2011.

Plant / Unit	Type of Fuel	$EG_{m,y}$ (GWh)	Specific Fuel consumption (tonnes/ MWh)	$FC_{i,m,y}$ (ktonnes)	$NCV_{i,y}$ (TJ/ ktonne)	$EF_{CO2,i,y}$ (tCO_2/TJ)	$EF_{EL,m,y}$ (tCO_2 / MWh)
AES Andrés	Natural Gas	2,072.22	0.158	327.63	46.5	54.3	**0.399**
Rio San Juan	Fuel Oil Nr. 2	9.82	0.283	2.78	42.4	72.6	**0.870**
Pimentel 1	Fuel Oil Nr. 6	183.98	0.213	39.25	40.7	75.5	**0.655**
Pimentel 2	Fuel Oil Nr. 6	156.56	0.213	33.39	40.7	75.5	**0.655**
Pimentel 3	Fuel Oil Nr. 6	358.61	0.202	72.61	40.8	75.5	**0.623**

The results of the emission factor calculation of each power unit are presented in the table below.

Table 9: Emission factor for the plants included in the build margin emission factor calculation (year 2011).

Company	Plant / Unit	Type of Fuel	Start of operations		Generation $EG_{m,y}$ (GWh)	EF plant $EF_{EL,m,y}$ (tCO_2/MWh)
			Month	Year	2011	2011
LAESA	Pimentel 3	Fuel Oil Nr. 6	September	2010	358.61	0.62
LAESA	Pimentel 2	Fuel Oil Nr. 6	September	2009	156.56	0.65
EGEHID	Pinalito 1 & 2	Hydroelectric	August	2009	126.97	0.00
EGEHID	Las Barias	Hydroelectric	April	2009	5.22	0.00
EGEHID	Magueyal 1 & 2	Hydroelectric	October	2008	10.96	0.00
CDEEE	Rio San Juan	Fuel Oil Nr. 2	June	2008	9.82	0.87
LAESA	Pimentel 1	Fuel Oil Nr. 6	October	2006	183.98	0.65

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[40] SENI Coordinating Organism (OC). Weekly reports. "ESTADO DE LA INFORMACIÓN CORRESPONDIENTE A LA PROGRAMACIÓN SEMANAL". Sheet: "Costos Variables de Producción".

[41] http://www.oc.org.do/ (Informe diario de Operación).

The 2009 data is available in the OC web site: http://www.oc.org.do/ >"Informes" > "Memorias" > "Año 2009". Tablas y Figuras Memoria Anual 2009.xlsx. Worksheet: "Tabla 51".

The 2010 data is obtained from the monthly reports from the OC. The monthly reports from year 2010 are available at the OC web site: http://www.oc.org.do/ > "Informes" > "Operacionales" > "Informe mensual de operacion"

Company	Plant / Unit	Type of Fuel	Start of operations		Generation $EG_{m,y}$ (GWh)	EF plant $EF_{EL,m,y}$ (tCO_2/MWh)
			Month	Year	2011	2011
EGEHID	Rosa Julia de la Cruz	Hydroelectric	N/A	2006	1.59	0.00
EGEHID	Domingo Rodriguez 1 & 2	Hydroelectric	August	2004	15.22	0.00
AES ANDRES	AES Andrés	Natural Gas	June	2003	2,072.22	0.40

Applying equation 12 of the "*Tool to calculate the emission factor for an electricity system*" version 02.2.1, **$EF_{grid,BM,y}$ = 0.436 tCO_2/MWh**

Step 6: Calculate the combined margin emissions factor

As stated in section B.6.1, the calculation of the combined margin (CM) emission factor (**$EF_{grid,CM,y}$**) is based on method ***(a) Weighted average CM*** of the *"Tool to calculate the emission factor for an electricity system"*, version 02.2.1.

The combined margin emission factor is calculated as follows (equation 13 of the tool):

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

According to the tool, wind and solar power generation project activities should apply the following values of **w_{OM}** and **w_{BM}** for the first crediting period and for subsequent crediting periods:
w_{OM} = 0.75 and **w_{BM} = 0.25**

Having $EF_{grid,BM,y}$ = 0.436 tCO_2/MWh, and $EF_{grid,OM,y}$ = 0.809 tCO_2/MWh.

The *ex ante* estimation of **$EF_{grid,CM,y}$** is **0.716 tCO_2/MWh.** This value will be adjusted ex-post on an annual basis.

Recall equation 6 of ACM0002 version 12.3.0 for the calculation of *ex ante* baseline emissions:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$ (Equation 6, ACM0002 v.12.3.0)

Applying the values of the terms on the right hand side, derived above, we have:

BE_y = **157,189 MWh/yr** x **0.716 tCO_2/MWh = 112,489 tCO_2/yr**[42]

Since, as noted above, ***ER_y* = *BE_y*** = **112,489 tCO_2 per year**.

B.6.4. Summary of ex ante estimates of emission reductions

[42] Note that the emissions factor is determined, in the Excel spreadsheet "ER Los Cocos II" to more than 3 decimals, so that the product as determined shown here is different from what one would obtain by using the value 0.716 shown here.

Year	Baseline emissions ($t\ CO_2e$)	Project emissions ($t\ CO_2e$)	Leakage ($t\ CO_2e$)	Emission reductions ($t\ CO_2e$)
2013	112,489	0	0	112,489
2014	112,489	0	0	112,489
2015	112,489	0	0	112,489
2016	112,489	0	0	112,489
2017	112,489	0	0	112,489
2018	112,489	0	0	112,489
2019	112,489	0	0	112,489
Total	**787,421**	**0**	**0**	**787,421**
Total number of crediting years	7 (in first crediting period)			
Annual average over the crediting period	**112,489**	**0**	**0**	**112,489**

Note that the values shown in the table are reduced in decimals. Specifically, as determined in the Excel spreadsheet "ER Los Cocos II", $\boldsymbol{EF_{grid,CM,y}}$ = 0.716 tCO_2/MWh. Moreover, because of rounding the Total for BE and ER do not exactly match the sum of the integer values shown in the table above.

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{facility,h}$ (or $EG_{PJ,h}$)
Unit	MWh/h
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in hour h
Source of data	Calculated as detailed in section B.6.1. The value will be the result of multiplying the value of the measurement of the Commercial Measurement System (SMC) at the 138/34.5 kV substation in hour *h* ($EG_{SMC,h}$) by the proportion of the electricity generated by Los Cocos II Wind Farm at each hour *h* ($K_{LCII,h}$).
Value(s) applied	17.94 MWh/h (estimated from expected annual electricity generation; the value is rounded in the PDD to two decimals, but used more precisely in the calculation sheets.)
Measurement methods and procedures	Calculated from other measurements
Monitoring frequency	Hourly
QA/QC procedures	The calculated value of the net electricity generation supplied by the project plant/unit to the grid in hour h will be cross checked with: 1. The sum of the individual measurements at lines L5-L6-L8-L9 of Cocos II at 34.5kV in hour h (which correspond to the total net electricity generation by Los Cocos II Wind Farm measured at 34.5 kV in hour h by PQ (LCII) equipment), (see measurement scheme in **¡Error! No se encuentra el origen de la referencia.**); 2. The summatory of the Scada data of each wind turbine of Los Cocos II Wind Farm 3. By 2019, energy measured with the energy meters at the 34.5 kV level that registers the total of the power plant Cocos II (i.e. parameter $EG_{L5+L6+L8+L9,LCII,h}$, see also measurement scheme in **¡Error! No se encuentra el origen de la referencia.**, M points for Los Cocos II Wind Farm***)***.[43] The lowest value will be applied in case of discrepancy. In addition, it will be checked that the result of sum of the proportion of the electricity generated by Quilvio Cabrera Wind Farm, Los Cocos Wind Farm and Los Cocos II Wind Farm is never higher than 1. In the case the sum is higher than 1, the value of the proportion of the electricity generated by Los Cocos II Wind Farm will be reduced until the sum is equal to 1.
Purpose of data	Calculation of baseline emissions
Additional comment	--

Data / Parameter	$EG_{SMC,h}$
Unit	MWh/h
Description	Quantity of net electricity supplied to the grid at Commercial Measurement System (SMC) point at the 138/34.5kV substation by Quilvio Cabrera Wind Farm, Los Cocos Wind Farm, and Los Cocos II Wind Farm in hour *h*
Source of data	HAINA dispatch data reports for the project
Value(s) applied	Not applied *ex ante*
Measurement methods and procedures	The measurement of the Commercial Measurement System (SMC) at the 138/34.5 kV substation represented by the measurement points SMC TR01, TR02, TR03 and TR04, will monitor the net electricity generated by Quilvio Cabrera Wind Farm – PQ(QC), Los Cocos Wind Farm – PQ(LCI),

[43] Since the invoicing process does not provide information on individual power plants of the generator companies, but only the lump-sum, this alternative QA/QC procedure is applied.

	Larimar and Los Cocos II Wind Farm – PQ(LCII), delivered to the grid. The SMC points of measurement will be located at the power delivery lines (Line 1 and Line 2) at the 138 kV voltage side of the project 34.5/138 kV substation, before the 138 kV bar of the wind farm interconnection. Line 1 and Line 2 are two circuits to the same power delivery line at the 138 kV voltage side of the project substation. Having two circuits increases the reliability of the line due to the line's redundancy. Line 1 will serve as a redundant circuit if required, in case of failure of the power delivery circuit L1 at 138 kV. The circuit Line 2 presents the same characteristics as Line 1 regarding the electricity meters (main electricity meter and backup meter), the measurement procedures and QA/QC procedures. The electricity generated at the SMC point will be measured by four electricity meters ION 8650 and ION 8600, class 0.2 (represented by SMC TR01, TR02, TR03 and TR04,). A main meter and a back up meter will be installed. The meters ION 8650 installed are bidirectional (Deliver and Receive). Its manufacturer is Schneider Electric. The measurement in the substation will follow the same measurement system as the Dominican Republic's electrical system standard, according to articles 287 and 288 of the Regulation for the application of the General Electricity Law 125-01. These articles define how the SMC should be constituted and the equipment to be applied. The Regulatory Office requires the following components: **A.** A system of measuring and recording active energy at each connection point: 1. Accuracy class 0.2 for current transformer (IEC standard) 2. Accuracy class 0.2 for Voltage transformers (IEC standard) 3. Accuracy class 0.2 for Energy Meters (IEC standard). The meters have non-volatile memory to store the information of the last forty (40) days at least, considering the use of five (5) channels and records every fifteen (15) minutes. They have built-in battery to keep data stored in memory for at least seven (7) days before the auxiliary power supply failure. According to article 307 of the Regulation for the application of the General Electricity Law 125-01, in each connection point 2 independent electricity meters should be installed: a main one and a back up one. Both meters should be the same class and can be connected to the same set of transformers. Thus, as required by the Regulatory Office, two meters will be installed in each point (principal and backup); the backup meter will follow the same requirements as the main meter. **B.** A communications system for recording data based on a public or private switch telephone network. According to article 316 of the Regulation for the application of the General Electricity Law 125-01, each connection point should count with a modem with a phone channel which allows the lecture of the registries at any moment, both of the main meter as well as the backup meter. Also, the communication system should enable the possibility of communications with a computer. **C.** A system of centralized data recording is located both in the electrical system's Regulatory office and the company headquarters in Santo Domingo. It records the following Magnitudes at each point of connection: 1. Active energy incoming and outgoing 2. Voltage average integrated over time to three phases.

	The measurement in the substation will be carried out by HAINA. Data will be recorded continuously and integrated and stored every 15 minutes, according to article 312 of the Regulation for the application of the General Electricity Law 125-01.
Monitoring frequency	Hourly
QA/QC procedures	Electricity meter specifications are according to legal requirements of Coordinating Organization in Dominican Republic and the specifications of the Regulation for the application of the General Electricity Law 125-01. Measurements will be conducted with calibrated measurement equipment according to relevant industry standards. Periodic calibration will be carried out according to the guidelines presented in the Regulation for the application of the General Electricity Law 125-01. Electricity meters will receive a periodic calibration at least every 2 years according to article 342 of the Regulation for the application of the General Electricity Law 125-01. Calibration of electricity meters will be performed as detailed in articles 342, 343, 344 and 345 of the Regulation for the application of the General Electricity Law 125-01. These evaluations will be carried out by specialized companies or with certified equipment. The measurement for the Commercial Measurement System (SMC) point will be cross-checked with: - The backup measurement at the SMC point. - Energy measured with the PQube equipment of each wind farm (Quilvio Cabrera, Los Cocos I and Cocos II) at the 34.5 kV level (i.e. parameters $EG_{PQ(QC),L1,h}$, $EG_{PQ(LCI),L2+L3,h}$,and $EG_{PQ(LCII),L5+L6+L8+L9,h}$,- see also measurement scheme in **¡Error! No se encuentra el origen de la referencia.*)***. [44] - Total electricity generation published in OC Reports at the end of the year (compared with the sum of all hourly generation) The lowest value will be applied in case of discrepancy. Collected data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Additional comment	--

[44] Since the invoicing process does not provide information on individual power plants of the generator companies, but only the lump-sum, this alternative QA/QC procedure is applied.

Data / Parameter	$K_{LCII,h}$
Unit	-
Description	Proportion of the electricity generated by Los Cocos IIWind Farm at each hour *h*
Source of data	Calculated as detailed in section B.6.1.
Value(s) applied	Not applied *ex ante*
Measurement methods and procedures	The proportion of the electricity generated by Los Cocos II Wind Farm at each hour *h* ($K_{LCII,h}$) is calculated dividing the total electricity generated by Los Cocos II Wind Farm measured at the 34.5 kV lines (PQube measurement of L5, L6, L8 and L9) by the total electricity generated by Quilvio Cabrera – PQ(QC), Los Cocos – PQ(LCI) and Los Cocos II PQ(LCII) Wind Farms, measured at the 34.5 kV lines (measurements of lines 1, 2, 3, 5, 6, 8 and 9), as detailed in section B.6.1 and **¡Error! No se encuentra el origen de la referencia.**. For this calculation, transformation losses are taking into account to be able to handle similar voltage levels (138 kV- network delivery point - $EG_{SMC,h}$) The measurement procedures for the parameters $EG_{PQ(QC),L1,h}$, $EG_{PQ(LCI),L2+L3,h}$, $EG_{PQ(LCII),L5+L6+L8+L9,h}$) monitored to calculate $K_{LCII,h}$, are detailed in the following tables. This calculation will be performed on an hourly basis.
Monitoring frequency	Hourly
QA/QC procedures	Since this value is calculated, QA/QC procedures for the parameters $EG_{PQ(QC),L1,h}$, $EG_{PQ(LCI),L2+L3,h}$ and $EG_{PQ(LCII),L5+L6+L8+L9,h}$ monitored to calculate $K_{LCII,h}$ are detailed in the following tables.
Purpose of data	Calculation of baseline emissions
Additional comment	--

Data / Parameter	$EG_{PQ(QC),L1,h}$
Unit	MWh/h
Description	Quantity of net electricity generated by Quilvio Cabrera Wind Farm measured at the 34.5 kV line, by the PQube (QC) equipment.
Source of data	Measurement records from the PQube (QC) equipment which adds the energy generated by wind turbines connected to L1 at 34.5 kV line.
Value(s) applied	Not applied *ex ante*
Measurement methods and procedures	The measurement of the net electricity generated by Quilvio Cabrera Wind Farm for L1, will be carried out by the PQube (QC) equipment at the 34.5 kV line. The PQube equipment 2.0 (QC), has an accuracy class 0.2S. These measurements will follow the same measurement system as the Dominican Republic’s electrical system standard. It will follow the standards presented in article 297 of the Regulation for the application of the General Electricity Law 125-01. According to this article, the measurements correspond to Category II, and thus, the PQube equipment is class 0.2S (IEC Standard). The measurement of the electricity generated by for Quilio Cabrera Wind Farm at line 1 (L1) will be carried out by CEPM and EGE Haina. Data will be recorded continuously and integrated and stored every 15 minutes, according to article 312 of the Regulation for the application of the General Electricity Law 125-01. Since the electricity measurement is calculated by means of measurements at 138kV ($EG_{SMC,h}$) and also 34.5 kV ($EG_{PQ(QC),L1,h}$). Transformation losses at the delivery point for electricity generation 138/34.5 kV substation are taken into account, applying the following transformation losses equation to Quilvio Cabrera generation data ($EG_{PQ(QC),L1,h}$).

	$$E(h)_{138\,kV}\lvert QC = E(h)_{34.5\,kV}\lvert QC - [8.44 + 0.003988 \times E(h)_{34.5\,kV}\lvert QC]$$ It is important to note that line L1 has an electricity meter type PM870MG accuracy class 0.5S, maximum currency: 10 A continuous. The meter PM870MG installed is bidirectional (Deliver and Receive), manufactured by Schneider Electric.This meter can also be considered for the monitoring of Los Cocos II Wind Farm. For this alternative a main meter and a back up meter are installed at L1, as required by the Regulatory Office; the backup meter follows the same requirements as the main meter.
Monitoring frequency	Hourly
QA/QC procedures	Electricity measurement specifications are according to legal requirements of Coordinating Organization in Dominican Republic and the specifications of the Regulation for the application of the General Electricity Law 125-01. Measurements will be conducted with calibrated measurement equipment according to relevant industry standards. Periodic calibration will be carried out according to the guidelines presented in the Regulation for the application of the General Electricity Law 125-01. Electricity meters will receive a periodic calibration at least every 2 years according to article 342 of the Regulation for the application of the General Electricity Law 125-01. Calibration of electricity meters will be performed as detailed in articles 342, 343, 344 and 345 of the Regulation for the application of the General Electricity Law 125-01. These evaluations will be carried out by specialized companies or with certified equipment. The measurements of the electricity generation at the 34.5 kV line L1, will be cross-checked with the data reported by the Scada of each wind turbine of the Wind Farm or by the L1 PM870MG meter. The lowest measurement will be applied in case of discrepancy. Collected data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Additional comment	This variable corresponds to the electricity output of Quilvio Cabrera Wind Farm, which is a separate CDM project currently registered.

Data / Parameter	***$EG_{PQ(LCI),L2+L3,h}$***
Unit	MWh/h
Description	Quantity of net electricity generated by Los Cocos Wind Farm (two lines) measured at the 34.5 kV line
Source of data	Measurement records from the PQube equipment (LCI) which adds the energy produce by the wind turbines connected to L2 and L3 at 34.5 kV line.
Value(s) applied	Not applied *ex ante*
Measurement methods and procedures	The measurement of the electricity generated by Los Cocos Wind Farm at the 34.5 kV lines L2 and L3 will be carried out by the PQube (LCI) equipment which adds the energy generated by wind turbines connected to L2 and L3 at 34.5 kV. The PQube equipment 2.0 (LCI), has an accuracy class 0.2S. These measurements will follow the same measurement system as the Dominican Republic's electrical system standard. It will follow the standards presented in article 297 of the Regulation for the application of the General Electricity Law 125-01. According to this article, the measurements correspond to Category II, and thus, the PQube equipment is class 0.2S (IEC Standard). The measurement of the net electricity generated by Los Cocos Wind Farm at line 2 (L2) and line 3 (L3) will be carried out by HAINA. Data will be recorded continuously and integrated and stored every 15 minutes, according to article 312 of the Regulation for the application of the General Electricity Law 125-01. Since the electricity measurement is calculated by means of measurements at 138kV (***$EG_{SMC,h}$***) and also 34.5 kV (***$EG_{PQ(LCI),\ L2+L3,h}$***). Transformation losses at the delivery point for electricity generation 138/34.5 kV substation are taken into account, applying the following transformation losses equation to Los Cocos I generation data (***$EG_{PQ(LCI),\ L2+L3,h}$***). $E(h)_{138\ kV}\|LCI = E(h)_{34.5\ kV}\|LCI - [25.59 + 0.003988 \times E(h)_{34.5\ kV}\|LCI]$ It is important to note that each line L2 and L3 has an electricity meter type PM870MG accuracy class 0.5S, maximum currency: 10 A continuous. The meters PM870MG installed are bidirectional (Deliver and Receive), manufactured by Schneider Electric. These meters are not considered for the monitoring of Los Cocos II Wind Farm because there is a lack of accurate data for the first months of 2018. For this alternative a main meter and a back up meter are installed at each line, as required by the Regulatory Office; the backup meter follows the same requirements as the main meter.
Monitoring frequency	Hourly
QA/QC procedures	Electricity measurement specifications are according to legal requirements of Coordinating Organization in Dominican Republic and the specifications of the Regulation for the application of the General Electricity Law 125-01. Measurements will be conducted with calibrated measurement equipment according to relevant industry standards. Periodic calibration will be carried out according to the guidelines presented in the Regulation for the application of the General Electricity Law 125-01. Electricity meters and PQube equipment will receive a periodic calibration at least every 2 years according to article 342 of the Regulation for the application of the General Electricity Law 125-01. Calibration of electricity meters will be performed as detailed in articles 342, 343, 344 and 345 of the Regulation for the application of the General Electricity Law 125-01. These evaluations will be carried out by specialized companies or with certified equipment.

	The measurements of the electricity generation at the 34.5 kV, lines L2 and L3 will be cross-checked with the data reported by the Scada of each wind turbine of the Wind Farm or by the L2 and L3 PM870MG meters, after 2018. The lowest measurement will be applied in case of discrepancy. Collected data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Additional comment	This variable corresponds to the electricity output of Los Cocos Wind Farm, which is a separate CDM project currently registered.

Data / Parameter	$EG_{PQ(LCII),L5+L6+L8+L9,h}$
Unit	MWh/h
Description	Quantity of net electricity generated by Los Cocos II Wind Farm measured at the 34.5 kV line, adding generation of lines L5 – L6 – L8 and L9.
Source of data	Measurement records from PQube equipment (LCII) which adds the energy produced by the wind turbines connected to lines L5 – L6 – L8 – L9 at 34.5 kV.
Value(s) applied	Not applied *ex ante*
Measurement methods and procedures	The measurement of the electricity generated by Los Cocos II Wind Farm at the 34.5 kV lines L5, L6, L8 and L9 will be carried out by the PQube (LCII) equipment which adds the energy generated by wind turbines connected to L5, L6, L8 and L9 at 34.5 kV. The PQube equipment 2.0 (LCII), has an accuracy class 0.2S. These measurements will follow the same measurement system as the Dominican Republic's electrical system standard. It will follow the standards presented in article 297 of the Regulation for the application of the General Electricity Law 125-01. According to this article, the measurements correspond to Category II, and thus, the PQube equipment class 0.2S (IEC Standard). The measurement of the net electricity generated by Los Cocos II Wind Farm will be carried out by HAINA. Data will be recorded continuously and integrated and stored every 15 minutes, according to article 312 of the Regulation for the application of the General Electricity Law 125-01. Since the electricity measurement is calculated by means of measurements at 138kV (***$EG_{SMC,h}$***) and also 34.5 kV (***$EG_{PQ(LCII), L5+L6+L8+L9,h}$***). Transformation losses at the delivery point for electricity generation 138/34.5 kV substation are taken into account, applying the following transformation losses equation to Los Cocos II generation data (***$EG_{PQ(LCII), L5+L6+L8+L9,h}$***). $E(h)_{138\,kV}\|LCII = E(h)_{34.5\,kV}\|LCII - [53.22 + 0.003988 \times E(h)_{34.5\,kV}\|LCII]$ It is important to note that each line L5, L6, L8 and L9 has an electricity meter type PM870MG accuracy class 0.5S, maximum currency: 10 A continuous. The meters PM870MG installed are bidirectional (Deliver and Receive), manufactured by Schneider Electric. These meters are not considered for the monitoring of Los Cocos II Wind Farm because there is a lack of accurate data for the first months of 2018. For this alternative a main meter and a back up meter are installed at each line, as required by the Regulatory Office; the backup meter follows the same requirements as the main meter.
Monitoring frequency	Hourly
QA/QC procedures	Electricity measurement specifications are according to legal requirements of Coordinating Organization in Dominican Republic and the specifications of the Regulation for the application of the General Electricity Law 125-01.

	Measurements will be conducted with calibrated measurement equipment according to relevant industry standards. Periodic calibration will be carried out according to the guidelines presented in the Regulation for the application of the General Electricity Law 125-01. Electricity meters will receive a periodic calibration at least every 2 years according to article 342 of the Regulation for the application of the General Electricity Law 125-01. Calibration of electricity meters will be performed as detailed in articles 342, 343, 344 and 345 of the Regulation for the application of the General Electricity Law 125-01. These evaluations will be carried out by specialized companies or with certified equipment. The measurements of the electricity generation at the 34.5 kV lines L5 – L6 – L8 – L9 will be cross-checked with the the data reported by the Scada of each wind turbine of the Wind Farm, or by the L5, L6, L8 and L9 PM870MG meters, after 2018. The lowest measurement will be applied in case of discrepancy. Collected data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Additional comment	This variable corresponds to the electricity output of ***this*** CDM project.

Data / Parameter	$NCV_{i,y}$
Unit	TJ/ktonne
Description	Net calorific value (energy content) of fossil fuel type i in year y
Source of data	NCV for fuel oil (kJ/Gal) and coal (kJ/kg) is obtained from the SENI Coordinating Organism (OC) weekly reports: "Estado de la Información Correspondiente a la Programación Semanal". Sheet: "Costos Variables de Producción". Fuel oil is converted from kJ/Gal to TJ/ktonne by dividing the value in kJ/Gal by the fuel density (in gr/lt) and by 3.7854 lt/gal. Coal is converted to TJ/ktonne dividing the value in kJ/kg by 1000. Since the OC does not publish NCV of Natural Gas, the value applied will be obtained from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2, Chapter 1. Table 1.2 (IPCC, 2006). IPCC default values at the lower limit of the uncertainty at a 95% confidence interval.
Value(s) applied	For Natural Gas: 46.5 TJ/ktonne For Coal and Fuel Oil Nr. 2 and 6 please refer to the spreadsheets in *Ex Ante Hourly Data - SENI.rar*
Measurement methods and procedures	Country specific NCV figures for fuels Coal and Fuel Oil Nr. 6 and 2 will be obtained from the weekly OC reports. These values are copied in the excel macro in order to be used for the calculation of the grid emission factor. Country specific NCV for fuels Coal and Fuel Oil are updated weekly. For Natural Gas since there are not available country specific NVC, then 2006 IPCC default figures will be used.
Monitoring frequency	The values will be reviewed annually for the year *y* in which the project activity is displacing grid electricity.
QA/QC procedures	The OC records present the best available information. NCV for fuels Coal and Fuel Oil will be updated weekly. IPCC default figures will be reviewed annually. The OC records are available at the web: http://www.oc.org.do/ Collected data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.

Purpose of data	Calculation of baseline emissions
Additional comment	--

Data / Parameter	$EF_{CO2,i,y}$ and $EF_{CO2,m,i,y}$
Unit	tCO_2/TJ
Description	CO_2 emission factor of fossil fuel type *i* used in power unit *m* in year *y*
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories, Reference Manual, Volume 2 (2006), chapter 1. Table 1.4. IPCC default values at the lower limit of the uncertainty at a 95% confidence interval
Value(s) applied	see table below
Measurement methods and procedures	Since country specific emission factors for fuels are not available 2006 IPCC default figures will be used.
Monitoring frequency	None, since IPCC default values are being used. The values will be reviewed annually for the year *y* in which the project activity is displacing grid electricity.
QA/QC procedures	None, since IPCC default values are being used.
Purpose of data	Calculation of baseline emissions
Additional comment	--

Fuel	Value	Unit	Source
Coal	89,5	tCO_2/TJ	IPCC, 2006
Natural Gas	54,3	tCO_2/TJ	IPCC, 2006
Fuel Oil Nr. 2	72,6	tCO_2/TJ	IPCC, 2006
Fuel Oil Nr. 6	75,5	tCO_2/TJ	IPCC, 2006

Data / Parameter	$EG_{m,y}$, and $EG_{n,h}$
Unit	MWh
Description	Net electricity generated by power plant/unit *m* or *n* in year *y* or hour *h*
Source of data	Official publications from the Coordinating Organization (OC) http://www.oc.org.do/
Value(s) applied	Please refer to the spreadsheets in *Ex Ante Hourly Data - SENI.rar*
Measurement methods and procedures	In the case of $EG_{n,h}$ the values will be monitored hourly for each hour *h* in the year y in which the project activity is displacing grid electricity. In the case of $EG_{m,y}$ the values will be monitored annually for the year y in which the project activity is displacing grid electricity. Daily reports will be downloaded from the OC website and processed as part of the emission factor calculation. Collected data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.
Monitoring frequency	See above.
QA/QC procedures	The OC records present the best available and verifiable information. These records are available at the web: http://www.oc.org.do/
Purpose of data	Calculation of baseline emissions
Additional comment	--

Data / Parameter	$FC_{i,m,y}$ and $FC_{i,n,h}$
Unit	Tonnes (Mass or volume unit)
Description	Amount of fossil fuel type *i* consumed by power unit *m* or *n* in year *y* or hour *h*
Source of data	Calculated based on specific fuel consumption and electricity generation of each power plant.
Value(s) applied	Please refer to the spreadsheets in *Ex Ante Hourly Data - SENI.rar*
Measurement methods and procedures	Specific fuel consumption and electricity generation data is obtained from official publications from the Coordinating Organization (OC) http://www.oc.org.do/. Daily reports will be downloaded from the OC website and processed as part of the emission factor calculation Collected data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.
Monitoring frequency	See above
QA/QC procedures	The OC records present the best available and verifiable information.
Purpose of data	Calculation of baseline emissions
Additional comment	--

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using version 02.2.1 of the "*Tool to calculate the emission factor for an electricity system".*
Source of data	Calculated as per the "*Tool to calculate the emission factor for an electricity system"* version 02.2.1. See Excel worksheet *"ER Los Cocos II"*
Value(s) applied	0.716 tCO_2/MWh
Measurement methods and procedures	Calculation as per the "*Tool to calculate the emission factor for an electricity system*" (version 02.2.1).
Monitoring frequency	Calculated annually
QA/QC procedures	Collected data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Additional comment	--

B.7.2. Sampling plan

There is no sampling involved in the monitoring of the proposed project activity.

B.7.3. Other elements of monitoring plan

The guidelines presented in the Monitoring and Verification Plan must be followed by the project activity implementers and operators of HAINA. The adherence to the procedures set out in this monitoring plan is necessary for the project managers and operators to successfully measure and track project impacts for audit purposes. CDM project developer MGM Innova will provide capacity building to the Technical Department of HAINA in order to meet the requirements presented in this MVP.

MVP worksheet

The methodology applied to this project activity describes the procedure and equations to calculate emission reductions from monitored data. The procedure to calculate emission reductions is simple, and it is presented in a excel worksheet which contains the different aspects of emission reduction calculation:

- Brief description of the monitoring structure and parameters
- Data entry sheets (*monitored values of the variables involved*)
- Responsible for data entry and calibration of equipment
- Calculation and result sheet (*emission reductions*)

There are worksheets where the user is allowed to enter data. Only those cells where the project staff is required to enter data have been left unblocked. All other cells contain model fixed parameters or computed values that cannot be modified by the monitoring staff.

A color-coded key is used to facilitate data input. The key for the code is as follows***:***

- ***Input Fields:*** Pale yellow fields indicate cells where project operators are required to supply data input, as is needed to run the model;
- ***Result Fields:*** Green fields display key result lines as calculated by the model.

Data gathering and recording

According to methodology ACM0002 (version 12.3.0), the main parameters that need to be monitored during the operation of the wind farm are:

- $EG_{PJ,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr), and
- $EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the *"Tool to calculate the emission factor for an electricity system"* (version 02.2.1).

Monitoring of electricity supplied by the project to the national electricity grid (SENI):

As detailed in section B.7.1, the Commercial Measurement at the 138/34.5 kV substation will monitor the net electricity generated and delivered to the grid by Quilvio Cabrera, Los Cocos and Los Cocos II Wind Farms. The SMC (Commercial Measurement System) points of measurement (SMC TR01, TR02, TR03 and TR04), will be located at the 138 kV line, before the 138 kV bar of the wind farm interconnection, in the 34.5/138 kV substation.

The quantity of net electricity supplied to the grid by the proposed project activity ($\boldsymbol{EG_{PJ,h}}$) will be calculated multiplying the value of the measurement of the SMC at the 138/34.5 kV substation in hour *h* ($\boldsymbol{EG_{SMC,h}}$) by the proportion of the electricity generated by Los Cocos II Wind Farm at each hour *h* ($\boldsymbol{K_{LCII,h}}$). This value represents the net electricity delivered to the grid by Los Cocos II Wind Farm.

As shown in **¡Error! No se encuentra el origen de la referencia.**, the net electricity generated by Los Cocos II Wind Farm will be carried out by the PQ (LCII) equipment which adds the energy produce by the wind turbines connected to L5, L6, L8 and L9, at 34.5 kV line. The total net electricity of Los Cocos II Wind Farm in hour *h* will be calculated as the sum of the four measurements at the 34.5 kV lines ($\boldsymbol{EG_{PQ(LCII),L5+L6+L8+L9,h}}$**)**. The measurement of the total net electricity generated by Quilvio Cabrera Wind Farm in hour *h* ($\boldsymbol{EG_{PQ(QC),L1,h}}$) will be carried out by the PQ(QC) equipment which measures the energy produce by the wind turbines connected to L1. And the measurement of the total net electricity generated by Los Cocos Wind Farm in hour h ($\boldsymbol{EG_{PQ(LCI),L2+L3,h}}$) will be carried out by the PQ(LCI) equipment which measures the energy produce by the wind turbines connected to L2 and L3 at 34.5 kV line.

The proportion of the electricity generated by Los Cocos II Wind Farm at each hour *h* ($\boldsymbol{K_{LCII,h}}$) is calculated as the sum of the net electricity generated by Los Cocos II Wind Farm ($\boldsymbol{EG_{PQ(LCII),L5+L6+L8+L9,h}}$) in hour *h*, divided by the total net electricity of Los Cocos, Los Cocos II and Quilvio Cabrera Wind Farms ($\boldsymbol{EG_{PQ(QC),L1,h} + EG_{PQ(LCI),L2+L3,h}} + \boldsymbol{EG_{PQ(LCII),L5+L6+L8+L9,h}}$) in hour *h*.

Since the electricity measurement is calculated by means of measurements at 138kV ($\boldsymbol{EG_{SMC,h}}$) and also 34.5 kV ($\boldsymbol{EG_{PQ(QC),L1,h} - EG_{PQ(LCI),L2+L3,h}} - \boldsymbol{EG_{PQ(LCII),L5+L6+L8+L9,h}}$). Transformation losses at the delivery point for electricity generation 138/34.5 kV substation are taken into account, applying the respective transformation losses equations for each wind farm generation data, as detailed in section B.6.1.

The electricity generated at the SMC point in hour *h* ($\boldsymbol{EG_{SMC,h}}$) will be measured by four electricity meters ION 8650, class 0.2 (SMC TR01, TR02, TR03 and TR04): a main meter and a back up meter will be installed, as required by article 307 of the Regulation for the application of the General Electricity Law 125-01. The measurement in the substation will follow the same measurement system as the Dominican Republic's electrical system standard, according to articles 287 and 288 of the Regulation for the application of the General Electricity Law 125-01.

As noted in the tables in Section B.7.1, the measurements at the 34.5 kV lines (lines 1, 2, 3, 5, 6, 8 and 9: $\boldsymbol{EG_{PQ(QC),L1,h} + EG_{PQ(LCI),L2+L3,h}} + \boldsymbol{EG_{PQ(LCII),L5+L6+L8+L9,LCII,h}}$) will be performed by the PQube equipment and will follow the same measurement system as the Dominican Republic's electrical system standard. According to 297 of the Regulation for the application of the General Electricity Law 125-01, the measurements correspond to Category II, and thus, the electricity meters will be of class 0.2S (IEC Standard). It is important to note that a main meter and a back up meter are installed at each line (L5, L6, L8 and L9), as required by the Regulatory Office; the backup meter will follow the same requirements as the main meter. Although they cannot be used for the main measurement, considering the lack of accurate data for the first half of 2018.

The net electricity generation, measured at the SMC point, will be monitored continuously and integrated and stored every 15 minutes using electricity meters located at the project site.

Monitored data will be recorded by the computer system, as detailed in section B.7.1. The recorded data will be centralized in the electrical system's Regulatory office and the company headquarters in Santo Domingo. Collected data on the measurement at the SMC point will be cross-checked against the backup measurement and electricity sales receipts and the values of electricity generation data published in OC Reports at the end of the year. The lowest value will be applied in case of discrepancy. The measurements at the 34.5 kV lines, used to determine the proportion of Los Cocos II, Los Cocos and Quilvio Cabrera electricity generation, will be cross checked with the data reported by the Scada of each wind turbine of the Wind Farms or after 2018, by the PM870MG meters located at each wind turbine line (L1-L2-L3-L5-L6-L8-L9), the lowest value will be applied in case of discrepancy. It will be checked that the sum of both proportions is not higher than 1.

Data will be recorded continuously and integrated and stored every 15 minutes. The recorded data will be centralized in the company headquarters in Santo Domingo

Electricity generation data will be aggregated and recorded on a daily basis and presented in the Monitoring and Verification Plan worksheet.

Calculation of the Combined Margin grid emission factor of the SENI:

The Combined Margin emission factor for the national grid of the Dominican Republic ($EF_{grid,CM,y}$) will be calculated *ex post* using dispatch data, and adjusted annually.

The Build Margin emission factor will remain fixed for the first crediting period, and is calculated as shown in section B.6.3. of this PDD.

The Operating Margin emission factor will be calculated applying a model developed by the project owner, which follows the guidelines detailed in section B.6.3 of this PDD. The model gathers data on net electricity generation by each power plant/unit *n* of the SENI in hour *h* ($EG_{n.h}$), their specific fuel consumption and the merit order of the SENI, on a daily basis, using daily electronic reports on SENI's operations, and processes this information in order to calculate the hourly dispatch emission factor. These reports are available on the SENI Coordinating Body's website.

Quality Assurance and Quality Control

The quality assurance and quality control procedures for recording, processing and archiving data will be followed, according to EB rules and requirements, to ensure accurate and consistent data is collected, and to allow the proper verification of the emission reductions on an annual basis.

Calibration of electricity meters will be implemented according to the standards and procedures adopted by the Regulatory Office for the SENI grid. Electricity meters will receive periodic calibration at least every 2 years according to article 342 of the Regulation for the application of the General Electricity Law 125-01. Calibration of electricity meters will be performed as detailed in articles 342, 343, 344 and 345 of the Regulation for the application of the General Electricity Law 125-01. Electricity transformers will be verified every 10 years. Electricity meters will be evaluated every 2 years. These evaluations will be carried out by specialized companies or with certified equipment. Calibration records will be kept by the project owner for verification purposes.

The values on electricity generation by the project activity will be applied according to the measurements and procedures described in section B.7.1. If there is a failure in the SMC electricity meters, the measurement is assured by a back up meter located at the project site.

All SMC electronic data will be backed up on a monthly basis, and two electronic copies of each document will be kept in different locations (the wind farm and its respective head offices). As a backup procedure, excel files containing the monitoring data will be sent to the head offices at Santo Domingo every week, in order to ensure that data is also stored in a different location. At the time of verifying the associated emission reductions, the loaded values will be cross-checked against the generated records in order to confirm that erroneous values have not been applied for the actual emission reduction calculation. For the electronic data recorded by PQube equipment - PQ(QC) – PQ(LCI) and PQ(LCII), this same protocol will be implemented by 2019.

Data Management System and Responsibilities

The monitoring of electricity generation and emission reductions of the project will be carried out by the project staff as described below. They will be responsible for the maintenance of traceable and updated records for verification purposes.

- *CDM Project Coordinator*:
    - Responsible for CDM data monitoring and recording activities, and review of calculations on emission reductions.
    - Responsible for communications with CDM parties (DOE, etc.), associates, and miscellaneous procedures related to CDM project activities
- *Commercial Department:*
    - Reports to the CDM Project Coordinator.
- *Operation and Maintenance Department at the Wind Park*
    - In charge of printing/retrieving data on electricity generation, and reporting to the commercial department.
    - Responsible for addressing and reporting any condition that could prevent the correct monitoring or data acquisition.

- Responsible for gathering data on electricity displaced by the project activity every hour and reporting on any condition that could prevent the monitoring or data acquisition by the control system.

Managers of the project must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to successfully develop and maintain the proper set of information to undergo an audit for a greenhouse gas (GHG) emission reduction investment. These records and monitoring systems are needed to subsequently allow a Designated Operational Entity to verify project performance as part of the verification and certification process. In particular, this process reinforces the fact that GHG reductions are real and credible to the buyers of the Certified Emission Reductions (CERs).

Verification of emission reductions

It is expected that the verification of emission reductions generated by the project activity will be carried out every 2 years. In order to facilitate the verification process, have a tracking of the project progress, and identify any potential problem, monthly reports will be developed based on the monitoring data and the calculations of emission reductions. These reports will be a basis for the development of the biannual report for the estimation of emission reductions from the proposed project activity.

Duration of the Monitoring Plan

The Monitoring Plan will be implemented over the 7-year crediting periods of project activity. All data and evidences collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period.

Training measures and maintenance procedures

The technical staff related to the O&M of Los Cocos II Wind Farm will receive training. The training includes a G90 and G97 course offered by Gamesa which includes the following subjects, among others: Introduction to wind energy; Safety; Power regulation; Control system: Generator; Operational modes; Yaw system; Gearbox; Electrical system; G90 and G97 brake hydraulics; G90 y G97 pitch hydraulics and SCADA. In addition a safety course will be taken by a member of the staff involved in Los Cocos II Wind Farm operation. If new personnel are hired, they will be formed in the specific skills required to carry out the Monitoring Plan.

Vestas will maintain and service Los Cocos II Wind Farm in proper working order in accordance with the Mechanical Operating and Maintenance Manual and the Electrical Operating and Maintenance Manual. The scheduled maintenance tasks are preventive measures and include service to the different components of the wind turbines such as yaw system, gearbox, brake hydraulics, generator, lubrication unit, nacelle, meteorological equipment and electrical parts. In addition, unscheduled maintenance tasks for Los Cocos II Wind Farm will be performed promptly, as and when necessary, to keep and maintain the Plant in good working order.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

29/12/2011
First payment to Cobra for the EPC contract (which is the first real action of project implementation). See Sec. B.5 for explanations and an overview of the project history.

C.2. Expected operational lifetime of project activity

20 years and 0 month

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable

C.3.2. Start date of crediting period

01/01/2013

C.3.3. Duration of crediting period

7 years and 0 month

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

Wind power is one of the cleanest forms for generating electricity. Following the presentation of an Environmental Impact Declaration (EID) for a wind farm at the Los Cocos site, covering both Los Cocos wind farm (presented as an earlier CDM project) as well as that proposed in this PDD, Los Cocos II wind farm project, the Ministry of the Environment and Natural Resources issued the Environmental Permit 1340-11 (EP 1340-11) on 18 May 2011, to cover both projects[45]. Specifically, EP 1340-11 covers 28 1.8 MW wind generators and an additional 25 2 MW wind generators, corresponding to the Los Cocos wind farm project and Los Cocos II wind farm project respectively. However, since Los Cocos II comprises 26 2 MW wind generators, HAINA submitted a variation on the Environmental Impact Declaration (EID) to the Ministry of the Environment and Natural Resources.

D.2. Environmental impact assessment

The EID report for Los Cocos II Wind Farm Project identified the possible environmental impacts of the project in the construction and operation phases, with the objective of proposing the mitigation measures to minimize such impacts. The study identified that the project generates positive and negative impacts on the environment. The physical environment is the most affected by the negative impacts, while the socio-economic environment is most affected by positive impacts. The construction phase causes 76% of the magnitude of negative impacts in the environment.

The following is a summary of the impacts identified in the EIA report for the construction and operation phases of the project:

- Change in drainage patterns (moderate impact)
- Activation of erosive process (moderate impact)
- Alteration of the soil properties (low impact)
- Alteration of landscape (significant impact)
- Alteration of air quality by the emission of gases and particulate material during construction phase (low impact)
- Increase in noise levels during operation of the wind farm (significant impact)

[45] Permiso Ambiental DEA No. 1340-11. See file “Permiso Ambiental LOS COCOS.pdf”

- Alteration of water quality during construction (moderate impact)
- Loss of vegetable cover (moderate impact)
- Reduction of available habitats and species (moderate impact)
- *Increase in local employment and economic activity during construction and operation* (significant impact)
- *Payment of taxes to the State during operation of the project* (significant impact)
- *Increase in the income levels of the community during operation of the project* (significant impact)
- *Increase in the demand of goods and services during construction and operation* (significant impact)
- *Improvement in life quality of the community during operation of the project* (significant impact)

The results of the environmental evaluation showed the necessity of develop and implement an environmental management and mitigation program which includes measures and actions to address the negative impacts of the project. The objective of the environmental mitigation and management program (PMAA) is to assure that the project contributes to the sustainable development and that complies all of the national environmental regulations. The PMAA is developed throughout environmental management programs, which are composed by management cards, where the prevention, control, mitigation and/or compensation measures are detailed. The PMAA is composed by 8 programs and 14 management cards. The PMAA contains the following programs:

- Program for management of temporary facilities
- Program for management of activities during construction
- Program of abandonment of temporary facilities
- Program of environment, health and security
- Program for management of emissions and noise
- Program for management of fauna
- Program of social management.
- Program for dismantling and abandonment.

These programs will be applied during construction, operation and/or abandonment phases of the project as appropriate.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

Three meetings were held with diverse stakeholders during 2010 with respect to the Los Cocos Wind Farm project, to get a complete scenario from local, governmental agencies and electricity sector authorities, students and the general interested public, as well as the people directly affected by the implementation of the project. The results of that Stakeholder Consultation were reported in the PDD of that CDM project, currently under validation.

The proposed project, Los Cocos II Wind Farm Project, is an extension of the earlier project. Two meetings were held for consultation with stakeholders for Los Cocos II Wind Farm Project.

First stakeholders' meeting: National Authorities and Organizations and General Public, held at Pontifical Catholic University, in Santo Domingo

The first meeting was held on 15 March 2012 at the University "Pontificia Universidad Católica Madre y Maestra" (PUCMM). An announcement was published in the newspaper, "Listín Diario" on 13 March 2012, see Figure 14.

Moreover, a number of national authorities and international organizations such as the World Bank, the Inter-American Development Bank (IDB) and the United Nations Development Programme (UNDP) were invited by letters that were personally delivered with acknowledgement of receipt[46]. National authorities included organizations such as the State-owned Dominican Company of Electricity Enterprises, the National Energy Council (Executive Director and Manager of Renewable Energy), the Climate Change and CDM Council, the Electricity Superintendence, the Ministry of Environment and National Resources (Minister as well as Vice Minister of Environmental Management), the Ministry of Economy, Planning and Development, the Coordinating Body for the National Electrical System of the Dominican Republic, the National Competition Council, the Electric Transmission Company (ETED).

Listín Diario

LA REPÚBLICA 13A

_NIHAO MUNDO

Celebra 3 años de su columna

Luis González agradeció espacio dado por LISTÍN DIARIO y su director para aportar al conocimiento de la historia de China.

omo "prestigiosa e influyente" fue definida anoche por el director de LISTÍN DIARIO, Miguel Franjul, la columna "Nihao Mundo" que escribe el politólogo y sinólogo, Luis González, y que el pasado sábado cumplió 3 años desde que salió por primera vez bajo el título ...ina, un gigante imposible de ignorar".

En tal sentido, el representante de la República Popular China en República Dominicana, Li Dong, organizó anoche una recepción en el restaurante Vesuvio del Malecón junto a Miguel Franjul, el autor de la columna y el presidente de la Cámara Dominico-China, ...erto Santana, en la que reconocieron los aportes que se han hecho a través de la columna que se publica todos los sábados en este diario.

"Seguiremos haciendo los esfuerzos por allanar los mejores caminos para que China y República Dominicana puedan alcanzar el anhelado estado de naciones amigas vinculadas en todos los sentidos", expresó Franjul.

"Creo que la columna ha sido muy importante porque ha sido un buen esfuerzo que ha durado tres años en forma consecutiva en el diario más prestigioso de este país", enfatizó Li Dong.

Luis González

Luis González:
El objetivo principal y primordial de nuestra columna publicada en este medio es plasmar y dar a conocer la cultura, la historia, la economía, la solidaridad y la política tanto interna y exterior de China como sociedad milenaria y de manera especial de República Popular China (RPCh).

_PUBLICITARIO

Ortiz presenta nuevo libro

Santo Domingo

El publicista y escritor Freddy Ortiz, columnista de LISTÍN DIARIO, presentará su sexta obra titulada Huevos de Codorniz.

Se trata de una minuciosa selección de más de doscientos artículos publicados durante quince años en este diario. Los mismos han sido agrupados por temas de la siguiente manera: Escribir, Filosofía de vida, Corrupción, Economía, Remesas y Cambio, Mercadología, Política, Drogas, Los Indecentes, Medio Ambiente, Talento Criollo y Crisis Social.

La obra se entregará a las bibliotecas del país de manera gratuita, gracias al apoyo del Banco BHD. Será presentada por Miguel Franjul, director de este periódico, en un acto a celebrarse en el salón Pellerano Alfau de la Editora Listín Diario.

Freddy Ortiz

EGE HAINA

LOS COCOS PARQUE EÓLICO

CONSULTA PÚBLICA

Proyecto de reducción de emisiones de gases de efecto invernadero mediante la construcción de un Parque Eólico.

La Empresa Generadora de Electricidad Haina, S.A. (EGE Haina), invita a participar en una reunión informativa sobre la instalación de aerogeneradores eléctricos en la provincia de Pedernales.

Con este proyecto la empresa busca la reducción de emisiones de gases de efecto invernadero mediante la implementación de prácticas mejoradas de generación eléctrica, reduciendo su huella ecológica y desarrollando el proyecto como Mecanismo de Desarrollo Limpio bajo los estándares del Convenio Marco de las Naciones Unidas sobre el Cambio Climático.

La presentación pública tendrá lugar en el Salón Octagonal VPO-03 de la Pontificia Universidad Católica Madre y Maestra, edificio de Postgrados, en la Avenida Rómulo Betancourt esquina Los Robles, el jueves 15 de marzo de 2012 a las 7:00 p.m., a fin de que se conozcan los beneficios del proyecto y que los presentes hagan sus aportes al respecto.

[46] Copies of the letters and the signature and seal of receipt can be found in the file "Acuses de Recibo-PUCMM.pdf"

Figure 14. Invitation to stakeholders' meeting at the Pontifical Catholic University on local newspaper

Some photos from the meeting are shown in Figure 15.

Figure 15: First Stakeholder Meeting at the University "Pontificia Universidad Católica Madre y Maestra"

The list of attendees to this meeting is presented in the following table:

Table 10: List of attendees at the first stakeholder meeting held at the University (15 March 2012)

Name	Company or Institution	Position
Federico A. Grullón	Climate Change and CDM Council	Technical Director and Coordinator, Climate Change and CDM
Julián Despradel	National Energy Council	Project Coordinator
Flady Cordero	National Energy Council	Planning Analyst
Lenín Diáz	INPROCA	General Manager
Félix E. Alcántara	EDEESTE (Electricity distribution company)	Assistant Manager, Operations
Fausto E. Aquino	Coordinating Organization from the National Electrical System of the Dominican Republic	Operations Engineer
Marino Incháustegui	EGE Haina and CEPM	Wind Farm Community Manager
Gustavo Penzo	EGE Haina	Development Manager
Antonio Morales	ARM Climbing SRL	General Manager
Emil Rojas	Ingeniería y Aire Acondicionado S.A.	
Víctor Antonio Haché Pepén	Telecommunications Engineer	
Alejandro Pérez	Consultant	
Rafael Pujals	DGIT (Internal Revenue Directorate)	Maintenance and project engineer
Norbo Marco Labrón	ETED, CCE (Dominican Electricity Transmission Company)	Director of Operations
Jaime F. Capell	United Nations Development Programme	Energy and environment specialist
Luis Alberto Vicioso Giménez	ETED CCE (Dominican Electricity Transmission Company)	Supervisory engineer
Alfredo Antonio Javier Santana	ETED CCE	Engineer
Carlos Ramírez Encarnación	ETED CCE	Supervisory engineer
Ámparo Céspedes H	UASD	Director IEM
Euripides Amaro	Epsalabco (Consulting company)	Commercial Director
Ramón O. Duran G.	Independent professional	
Germán D. Bello Peralta	PUCMM (university) INPROCA	Professor, Project Engineer
José Atizal	SOECI	Member
María Virgen Gómez	EGE HAINA	Commercial Manager
Cheny Reyes	EGE HAINA	Commercial Coordinator
Ángel Rodríguez	Electromega	Project Department
Rafael Adalberto Tejado	Ferreteria Americana	Manager
Osvaldo Irusta Zambrana	OC-SENI (Coordinating Organization from the National Electrical System of the Dominican Republic)	
Bones Casilla	CEPM	Electric Supervisor
Mónika Leschhorn Fernández	EGE HAINA	

Besides the names in the attendance sheet, above, at least one other person appeared to have been present, since she submitted response to the questionnaire circulated: Solange de la Cruz Matos (journalist).

A questionnaire was circulated inviting opinion on the project

Second stakeholders' meeting: with the community at project site

A third stakeholder meeting was held with the community on March 17, 2012 with local stakeholders.

Some photos of the event are shown in Figure 16 and Figure 17.

Figure 16. Some photos from second stakeholders meeting, 17 March 2012

Figure 17. More photos from second stakeholders meeting, 17 March 2012

The list of the attendees is presented in the table below. The list is based on an attendance sheet where people signed in their name, place of residence, phone, and signature.

Table 11: List of attendees to stakeholders' meeting with the local community

Name		Name	
1	Dichoso Polanco Feliz	29	Claudio E. Dotel Piña
2	Felipe Feliz Cueva	30	Heriberto Cuevas M.
3	Silvestre Polanco Feliz	31	Joaquín Pérez
4	Yenifer Ramírez Acosta	32	Israel Pérez
5	Rogelio Pérez Hernández	33	Justo Samboy
6	Milagros de Jesús Ramón Samboy	34	Williams Alfredo Castillo
7	Miguel S Oclu (illegible)	35	Jesús Peralta
8	Isabel (Leobel?) Langres	36	José Manuel Sánchez
9	Manuel Ramón Pérez	37	Pedro M. Samboy
10	José Urbáez Cerrero	38	Rosalía Samboy Féliz
11	Antonio (illegible)	39	Pedro M. Samboy *(repeated name and signature, see 37 above)*
12	Ricardo Mellor	40	(Illegible)
13	Luis Milton Caraballo	41	Marquiades Lorenzo
14	José Joaquín Carvajal Sánchez	42	Rafael Mata
15	Carlos Guzmán Caballero	43	Eva Mibol
16	Víctor Méndez Terrero	44	José Manuel Sánchez
17	Antonio Feliz Pérez	45	José María Vilomar
18	Clodomiro Féliz	46	(illegible) Cuesta Borges
19	Manuel Gómez	47	(illegible) La Paz
20	Francisco S. Reynoso G.	48	Bradis Vanessa Pérez
21	Alexis Florián Gómez	49	Carmen Segura
22	Salvador Castillo C.	50	(illegible) Gómez
23	Juan de Dios Sánchez Urbáez	51	Nelson Ruddys (illegible)
24	José Antonio Sueros	52	José Gómez P.
25	Cristián Francisco Pérez P.	53	(illegible) Cuevas
26	Dolores Feliz S.	54	Ángel (illegible)
27	Eunice Margarita Matos Feliz	55	Antonio (illegible)
28	María D. Féliz Matos	56	

Besides the names in the attendance sheet, above, a number of other people appeared to have been present, since they submitted responses to the questionnaires circulated. These people are listed below:

- Yocosta D'Nieveros
- Manuel de Jesús Fernández
- Francisco Placenas
- Richard O. Galaza
- Dichosa Pérez

E.2. Summary of comments received

As noted above, a questionnaire was circulated at each stakeholder meeting.

26 persons filled in questionnaires following the first stakeholder meeting. The comments were all favorable, with many people suggesting the expansion of renewable energy in general, and wind power in particular. One suggested diversifying across renewable energy sources. One asked why the makers of wind generators were being changed from Vestas (Los Cocos Wind Farm, an earlier Project, currently at Validation) to Gamesa (this project).

38 persons filled in questionnaires following the second stakeholder meeting. The comments were all favorable. Many of those responding represented community groups. Some requested that the company provide benefits to the community unrelated to the project activity. These included: public toilets, maintenance and construction of sports facilities, education, etc. A few suggested that the company should provide free service, for the use of the land. Some asked that the project provide jobs to the community members.

E.3. Consideration of comments received

The comments were in line with the main social and environmental concerns of the local community. Doubts were clarified during the meeting.

SECTION F. Approval and authorization

The letter of approval from the Party for the project activity was not yet available at the time of submitting the PDD to the validating DOE

Appendix 1. Contact information of project participants

Organization name	Empresa Generadora de Electricidad HAINA (EGE HAINA)
Country	Dominican Republic
Address	Avenida Lope de Vega, número 29, Torre Novocentro, Piso 17.
Telephone	+1 809-947-4008
Fax	+1 809-616-1522
E-mail	estevezr@egehaina.com RodriguezJ@egehaina.com
Website	http://www.egehaina.com/
Contact person	Luis R. Mejía Brache (primary authorized signatory) José Alfredo Rodriguez (alternative authorized signatory)

Appendix 2. Affirmation regarding public funding

No funding from Annex I parties is available for the proposed project activity

Appendix 3. Applicability of methodologies and standardized baselines

All information on the validity of the selected methodology was provided in Section B.2.

Appendix 4. Further background information on ex ante calculation of emission reductions

Appendix 5. Further background information on monitoring plan

Appendix 6. Summary report of comments received from local stakeholders

Appendix 7. Summary of post-registration changes

It is important to clarify that from January 1st 2018 the PQube equipment located at the 34,5 kV line (For Quilvio Cabrera measuring L1, for Los Cocos I measuring L2+L3 and Los Cocos II measuring L5+L6+L8+L9), works as an internal data measurement of Quilvio Cabrera, Los Cocos I and Los Cocos II Wind Farms.

PQ (QC) = L1 (Set of wind turbines connected to L1)
PQ (LCI) = L2+L3 (Set of wind turbines connected to L2 and L3)
PQ(LCII) = L5+L6+L8+L9 (Set of wind turbines connected to L5, L6, L8 and L9)

The PQube equipment will be calibrated every 2 years

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the “CDM project standard for project activities” and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the “CDM project standard for project activities” (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the “Project design document form for small-scale CDM project activities” (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).

Version	*Date*	*Description*
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

Decision Class: Regulatory
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